

### Unit 3 (Structures): Models We Can Make

**Concept** Models are copies of objects; models help us plan how to make structures and other objects. Models have a scale, which helps us understand the size of the actual object being modeled.

**Content Objectives** Teams make a small model of a big structure and play a game guessing other teams' models.  
Students will follow the steps of a design brief to design a model.  
Students will apply principles of assessment to models created by other students.

**Language Objectives** Students will discuss and use the following terms as part of oral discussions: models, engineering design, design brief.  
Students will describe a basic engineering model.  
Students will understand the words prototype, specifications and process in written paragraphs.

#### 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**
  - **3C** Represent the natural world using models and identify their limitations, including size, properties, and materials
- **ELPS**
  - **1C** Use strategic learning techniques such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing to acquire basic and grade-level vocabulary. [Metacognitive Strategies]
  - **2D** Speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency [Application for Acquisition]
  - **3H** Narrate, describe, and explain with increasing specificity and detail as more English is acquired. Read silently with increasing ease and comprehension for longer periods

- **4F** Use visual and contextual support and support from peers and teachers to read grade-appropriate content area text, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language

**Tools**

Wheels and craft sticks

**Materials**

Access to all construction materials, such as glue, string, wood pieces, cloth, etc.

Access to recycled materials of choice.

Handouts **3.3.1-3.3.5**

Design Brief **3.3.4** copied onto a chart for the class to see.

**Literature**

*The Legos Idea Book: Unlock Your Imagination*

**Connections**

**Day 1: Engage/Explore**

Teacher Says/Does	Student Says/Does	Language requirements
<p>1. Present the four questions about models in <b>3.3.1</b> to students. Have students work in pairs and respond to the first question, by defining in their own words what models are. Proceed to the second question and have them discuss if any of them have hobbies in which they work with models. Similarly, ask student pairs to find one or two examples of models in the classroom. Show the students sample car models and have them look around the room and in other places to find other models. Finally, ask them to share their ideas of how models of cars can help car builders. Discuss with them that models can be smaller than the object of which they are copies, and show and talk about examples.</p> <p>Pass out a copy of the card phrases <b>3.3.2</b> to each student pair, and have them construct a paragraph about the process of engineering design using the phrases in the handout. Once the paragraph is constructed, have student pairs compare the paragraphs they came up with with other teams. Encourage them to pause after each phrase, and make comments about word meanings <b>3.3.3</b>.</p> <ul style="list-style-type: none"><li>❖ For a class with struggling readers and writers, you may construct the paragraph as a whole group and discuss the meaning in more depth.</li></ul>	<p>Students answer questions about models</p> <p>Students construct a paragraph about the process of engineering design</p>	<ul style="list-style-type: none"><li>• Models</li><li>• Engineering design</li><li>• Design brief</li><li>• Prototype</li><li>• Specifications</li><li>• Process</li></ul>

**Day 2: Explore/Explain**

Teacher Says/Does	Student Says/Does	Language requirements
<ol style="list-style-type: none"> <li>1. Show the students the Design Brief <b>3.3.4</b>. Explain that a Design Brief is a problem for their team to solve. To begin solving a Design Brief problem, they need to read the specifications, and think about how they would meet them.</li> <li>2. Organize students in pairs or groups as convenient. Give each pair/group a copy of the card with the description of the design brief. Discuss and display the following steps to support their work:               <ul style="list-style-type: none"> <li>• Read the Design Brief.</li> <li>• Ask questions about what the words mean.</li> <li>• Once you understand what the words in the Design Brief mean, talk with your partner and plan what you might make.</li> <li>• Students will make several preliminary sketches, select one, and make a labeled sketch to present to the class.</li> <li>• Either using cut pieces of paper or drawing, make a plan for the car you will make. Discuss who will do which job, and how you will make sure both people have interesting jobs.</li> </ul> </li> <li>3. Have teams start building a model of their car.</li> <li>4. When the student teams have worked on the task, have them tell you about their planning, the steps they have followed, about their ideas and how they worked together as a group. Check to be sure they understand the word “model,” and that they are making a small model of a big thing.</li> <li>5. Have the teams dictate to you a description of their model. In the description they should tell where their ideas came from. Give feedback as appropriate.</li> </ol>	<p>Students ask and answer questions about the Design Brief</p>	<p>Design Brief</p> <p>We followed the following steps:            First, we _____            Then, we _____            Finally, we _____</p>



What are models?

Have you ever worked with models?

What are examples of models in our classroom?

How do models help people who build cars?

Cards for activity to construct a paragraph about what engineering design is:

Engineering design is	the process of devising a system
to meet desired needs.	It is a decision-making process.
The design process	involves several steps:
beginning with asking questions,	in order to clarify the problem,
planning and creating a model,	and testing a prototype
against the specifications in the design brief.	

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## Design Brief Description

**Goal:** Design and make a model of a car

### **Specifications and Constraints:**

- You must use materials available to everyone.
- You should draw and label your plan and present it in a design review.
- You should get approval before you begin.
- You should practice safety at all times.

## Assessing the design of the model.

	To some degree	To a moderate degree	To a large degree
<b>CONTENT</b>			
(Used recycled material) <sup>1</sup>			
(Used synthetic materials)			
(Used natural materials)			
<b>SKILLS</b>			
(Worked well in a team)			
(Presented ideas and product to the class)			
(Participated in a design review)			
(Helps clean up)			
<b>PRODUCT</b>			
(The model works)			
(A drawing of the design was presented)			
(Team met the constraints of time)			
<b>TOTAL POINTS</b>			

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<sup>1</sup> The criteria in parenthesis should be replaced with ideas from students.