

Lesson 1: How I get to School

Lesson Snapshot

Overview, Grades 3-5

Big Idea: Engineering structure, particularly bridges, allow us to arrive at our destinations in a reasonable amount of time.

Teacher's Note: Big ideas should be made explicit to students by writing them on the board and/or reading them aloud.

Purpose of Lesson: To introduce students to common types of bridges, their components, and how they affect our daily lives.

Selected Learning Objectives: Students will learn to:

1. Describe different types of bridges and design features that make them unique.
2. Identify three components of a bridge and what roles the components serve in the bridge system.
3. Explain how bridges make our daily transportation needs easier and more effective.

Lesson Duration: Two to Three hours.

Activity Highlights

Engagement: Students, working in groups of 2 or 3, will be asked to compare and contrast their commutes to school.

Exploration: Students, working in pairs, will look at bridges provided online.

Explanation: The teacher will discuss bridge types and design. Additionally, the teacher will outline the history on bridges in Indiana.

Extension: Students, working in pairs, revisit the exploration activity.

Enrichment: Students, working in groups of two, will create paper bridge models.

Lesson 1: 5-E Lesson Plan

Engagement

1. Students, working in groups of 2 or 3, will be asked to compare and contrast their morning trips to school. The teacher will ask the follow questions to guide discussion:
 - a. What makes it faster to get to school?
 - i. Cars
 - ii. Buses
 - iii. Roads
 - b. What makes it safer?
 - i. Traffic Lights
 - ii. Police officers
 - iii. Speed limits
 - iv. Guard Rails
 - c. What makes it possible?
 - i. Roads
 - ii. Bridges
2. Students will report out what they discussed in groups.
3. Teacher will list all of the students ideas, and highlight important technologies that make our life safer, easier, and possible
4. Teacher will highlight a local bridge that several student cross on the way to school.
5. Teacher will ask the following question:
 - a. How would you make it to school without that bridge?
6. Teacher and students will discuss other ways to get across as if the bridge wasn't there.
 - a. Ferry, (Water)
 - b. Longer route
7. Teacher will state that bridges make our lives much easier and safer.

Exploration

1. Students, working in pairs, will view bridges of Indiana online at:
 - a. <http://earchives.lib.purdue.edu/cdm4/browse.php?CISOROOT=/inbridge>
2. Students will discover 10 unique bridges and record way they are unique from other bridges on the website. Student Resource 1, Lesson 1

Explanation

1. The teacher will present on bridge design features and components.
 - i. Teacher Resource 1, Lesson 1

Extension

1. Students, working in pairs, revisit the exploration activity. Teacher Resource 1, Lesson 1, Slide 4

Enrichment

1. Students, working individually, will create paper bridge models consisting of a deck, superstructure and substructure.
 - a. Student Resource 2, Lesson 1

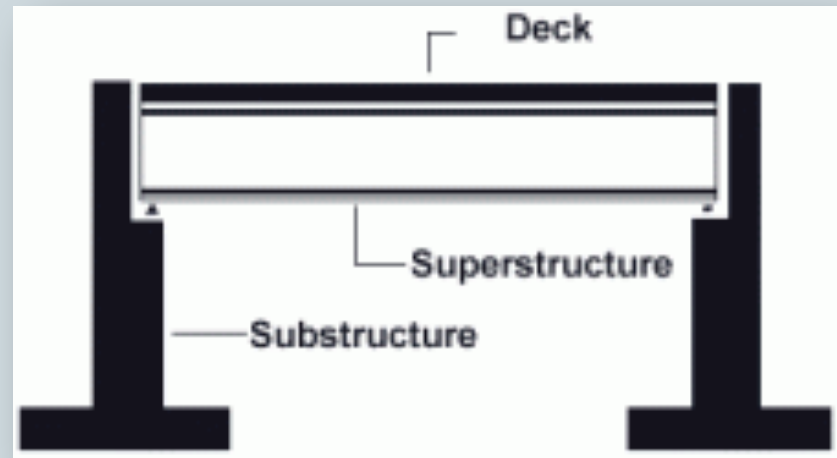
Basics of Bridges



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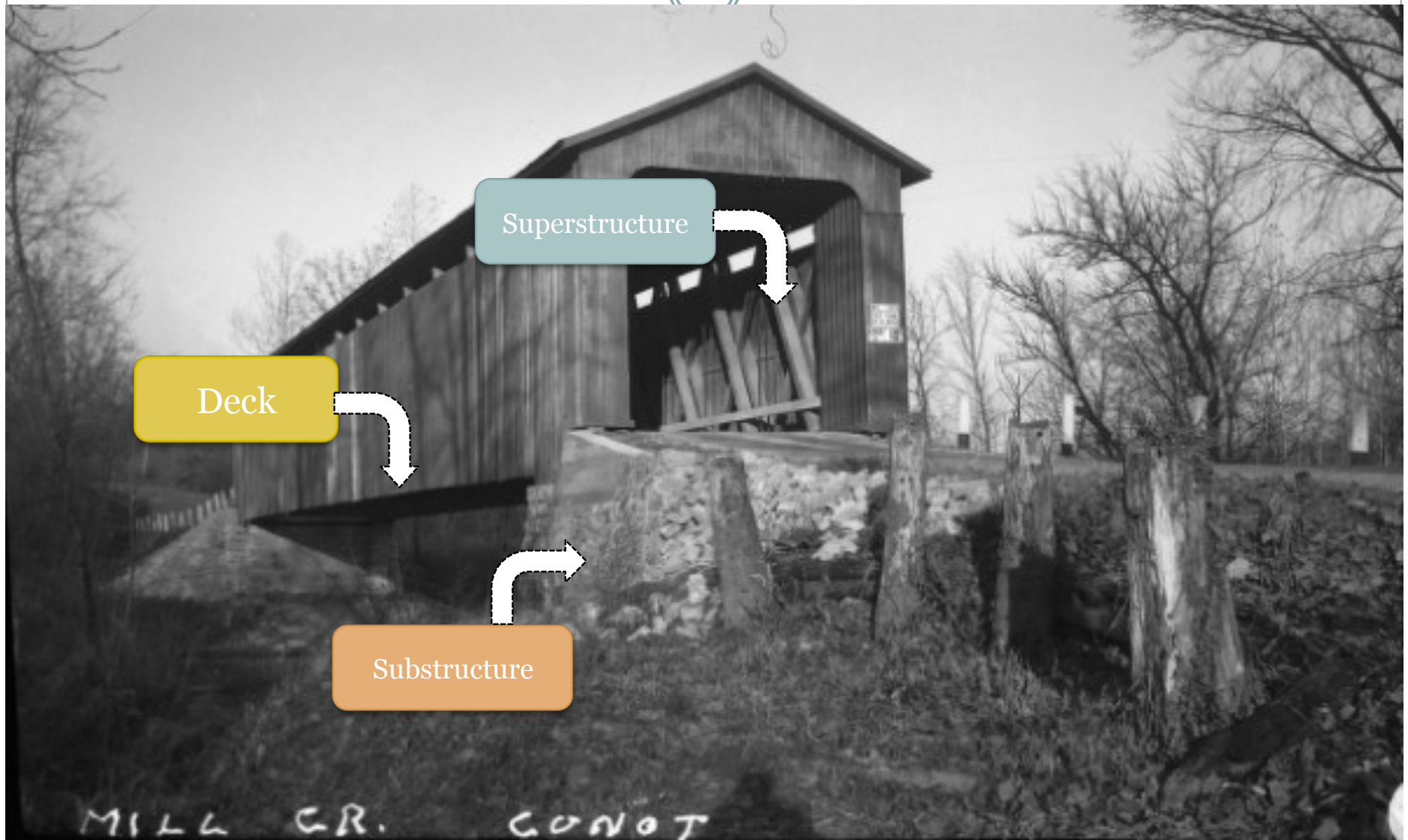
Three main parts of every Bridge

- Every Bridge has:
 - Deck
 - ✦ Allows people to cross
 - Superstructure
 - ✦ Supports the deck “Span”
 - Substructure
 - ✦ Supports the Superstructure
 - ✦ Connects to the environment



Span – Distance from one side of the bridge to the other.

Can you identify the three components of a bridge?



Revisit the Historical Bridges of Indiana



Extension Activity

- Visit PBS Building Big, Bridge Basics
 - <http://www.pbs.org/wgbh/buildingbig/bridge/basics.html>
- Select 5 of your bridges from the exploration activity
 - <http://earchives.lib.purdue.edu/cdm4/browse.php?CISOROOT=/inbridge>
 - Option 1
 - ✦ Make a PowerPoint slide for each bridge and identify each component: deck, substructure, superstructure. Similar to previous slide.
 - ✦ Add identification for beam, piers, and span.
 - Option 2
 - ✦ Print out pictures of each bridge. Color code each component: deck, substructure, superstructure.
 - ✦ Add identification for beam, piers, and span.

Report back



- Is it always clear where the components start and stop?
- What did some of the components look like?
- What common materials was the decks made of?
Superstructure? Substructure?
 - Why are decks commonly concrete or wood? *Pushing force*
 - Why are the superstructures steel? *Pulling force*
 - Why are the substructures concrete as well? *Pushing force*
- What common shapes do you see in superstructure?
 - Triangles, Squares?

Exploration: Bridges of Indiana

Instructions:

1. Visit the following website, Purdue University, e-Archives
 - a. <http://earchives.lib.purdue.edu/cdm4/browse.php?CISOROOT=/inbridge>
2. Search and list, by title, 10 bridges based on a bridge style and record what material the bridge was constructed with. See Example.

	<i>Bridge Title</i>	<i>Bridge Material</i>	<i>Bridge Style</i> “What does the bridge in the picture look like?”
Ex.	Clinton, Indiana, Road 63 [63-D-91A; Contr. 2276] Wabash River	Iron and steel	3 Arches
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Enrichment: Bridges, Making them stand!

Instructions:

1. In the following activity, you will test your understanding of bridge components and how they work together.

Challenge:

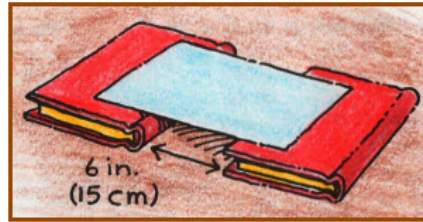
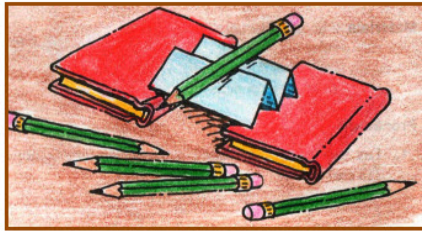
Design a bridge out of common materials that will support the weight of two micro-cars.

Requirements:

1. Must span at least 5 inches.
2. Must be constructed with only the material provided.
3. Must consist of three identifiable components:
 - a. Deck
 - i. Can only touch the cars and super structure
 - b. Superstructure
 - c. Substructure

Things to think about:

1. Shapes are important!



2. Use your materials wisely. Your teacher will give you several materials. Test each material and check what you think is the material's strength/weakness.

	<i>Material</i>	<i>Push</i>	<i>Pull</i>
Ex.	Straw	Weak	Strong
1			
2			
3			