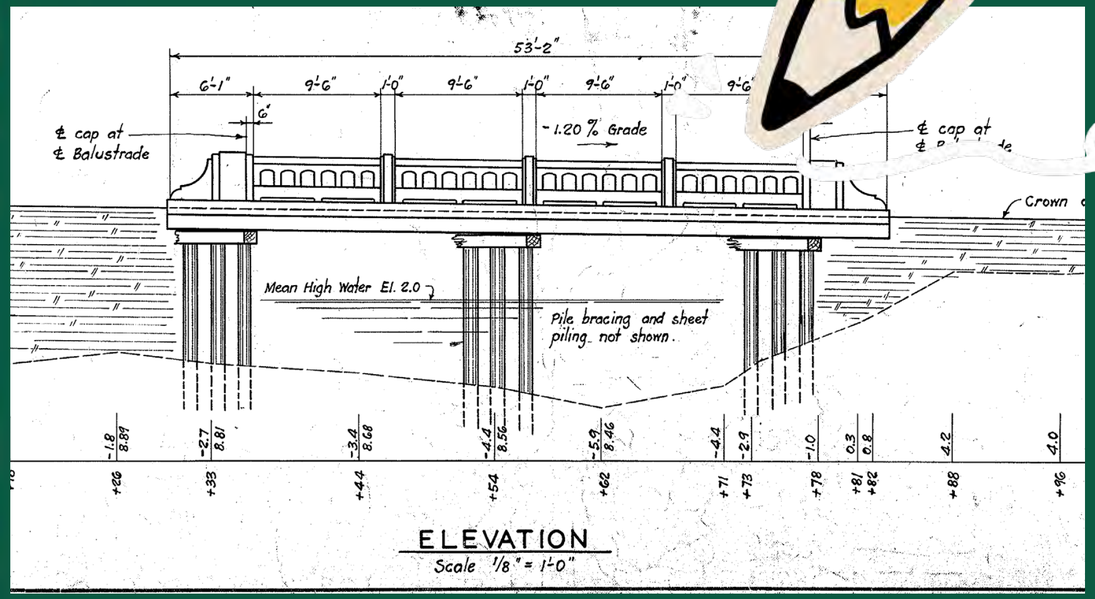


Bridging Maryland, Becoming Engineers

Learning About Bridges and How They are Made (Grades K -3)

Lesson 1

Objective and Overview

01 In this unit, we will learn about the Engineering Design Process. We will learn how engineers use their knowledge about types of bridges and materials (steel, wood, etc.) to build a bridge.

Essential Questions

01 What are the parts of a bridge?

02 How does each part help the bridge stand?

Before we get started …

What is an engineer?

Engineers use science and math to figure out the best way to create new things or to improve how something that has already been created works.

“” Engineers design and build everything from roads, bridges and buildings to robots.””

Today we will talk about how bridges are made.

Raise your hand if you can say what a bridge is or what it does?

Bridges are built to get you over something.

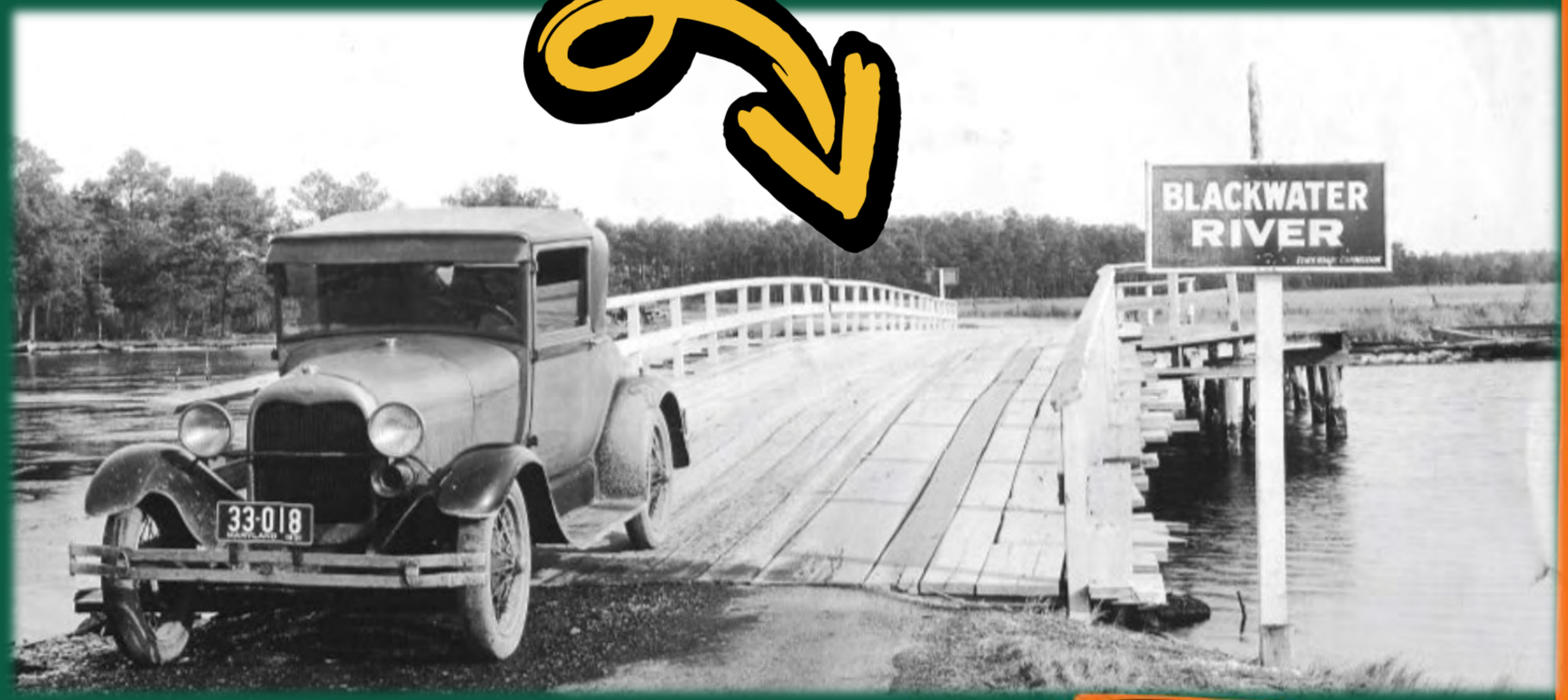
They can go over water

Some go over roads.

Some go over railroad tracks.

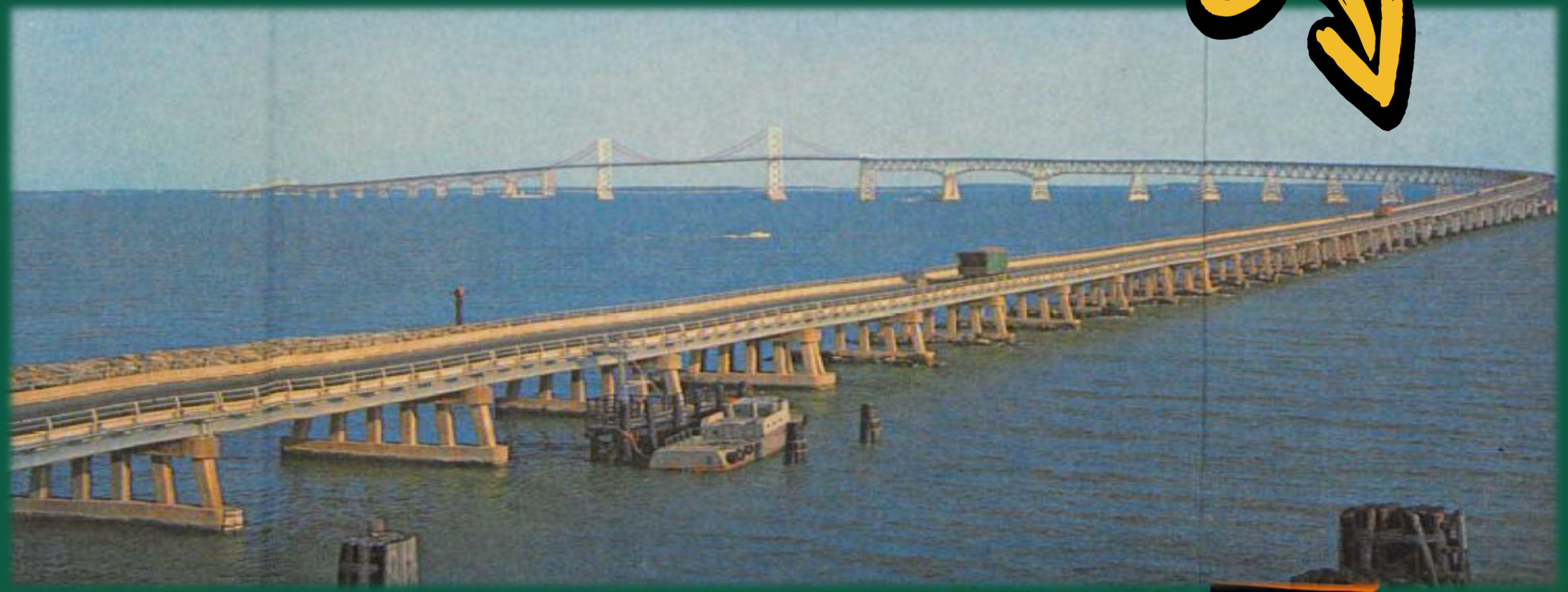
What materials are bridges made of?

Some bridges are made of wood.



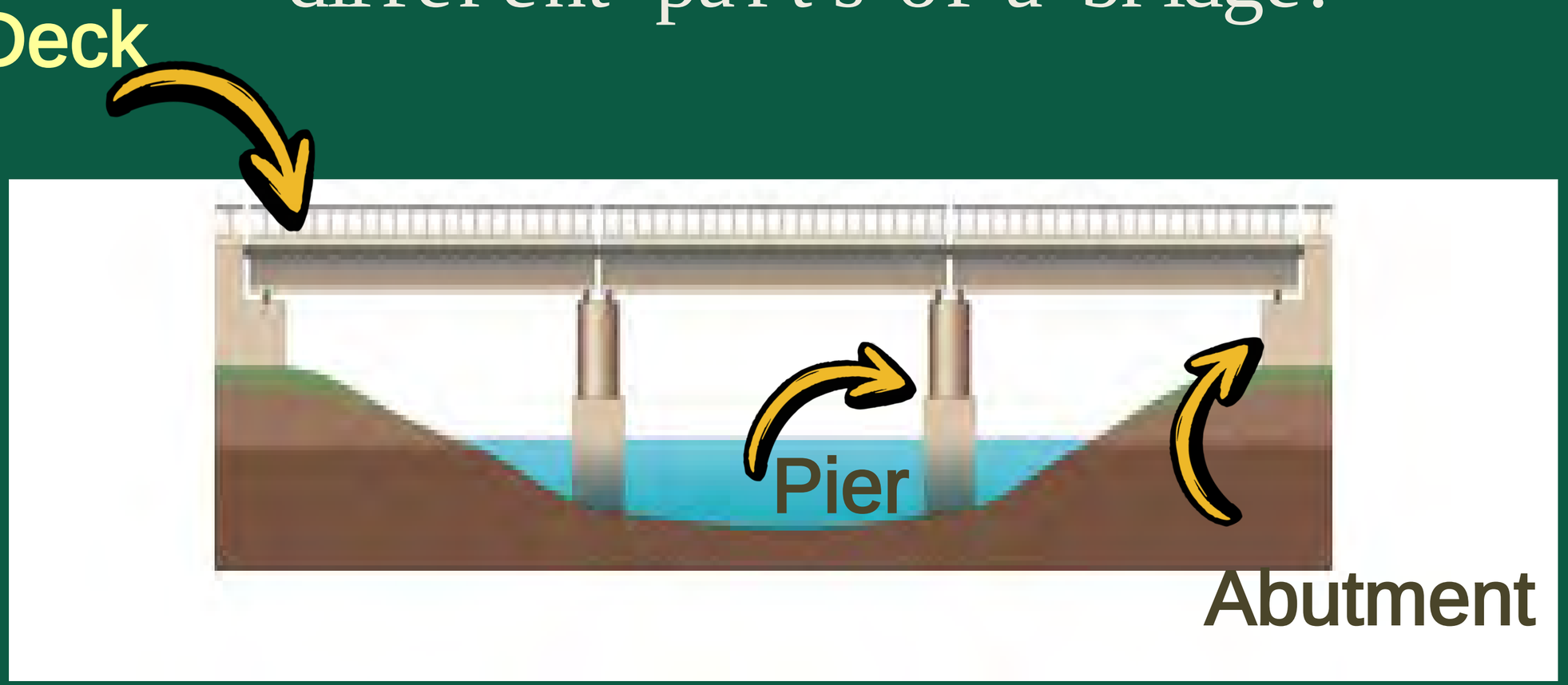
Some bridges are made of concrete.

Some bridges are made of steel.



Some bridges are made of stone and iron.

This diagram shows the names for different parts of a bridge.



Bridge Deck

This is the top of the bridge where people walk and cars drive.

Piers

These hold up the middle of the bridge.

Abutment

These anchor the bridge to the ground at both ends.


WHAT
MAKES
BRIDGES
SO STRONG?

“”The Engineering Design Process!””

A process is a series of steps one takes to make something or reach a goal.

Engineering Design Process

Step 1

What do we need to cross?

Step 2

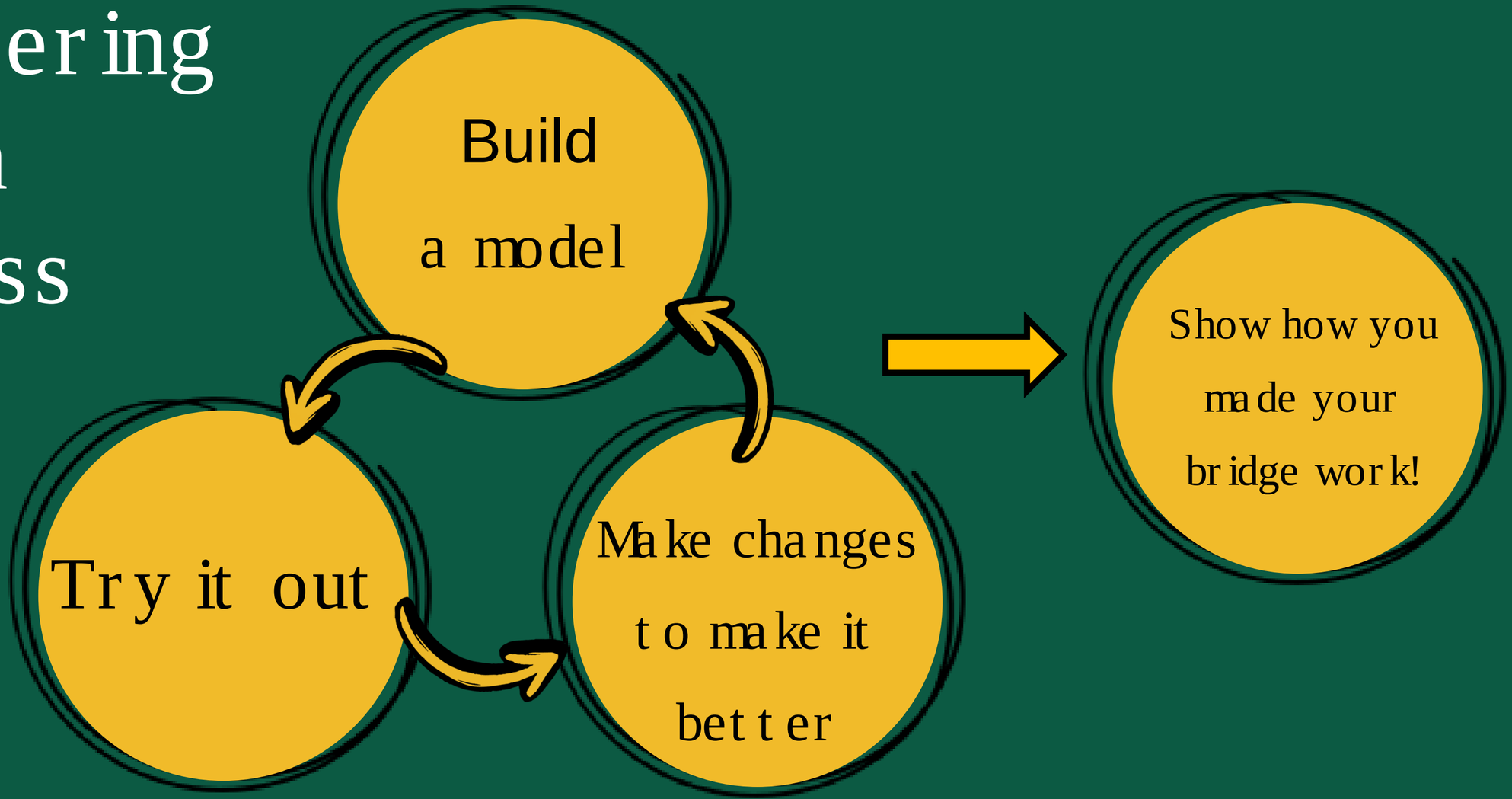
How can we cross it?

Step 3

What is it made of and how should it look?

Engineering Design Process

Continued



Keep in mind, you don't always get it right the first time.

Sometimes you must change your model and try again.


Lesson 2

Objective and Overview

01 In this unit, we will learn about the Engineering Design Process and how engineers use their knowledge about bridge forms and materials and how they work together.

02 We will also build and test some model bridges.

03 We will use hands-on activities to learn about how engineers have used the Engineering Design Process to solve problems.

Essential Questions

01 How do we make a bridge using the engineering design process ?

Review

In Lesson 1, we learned about the steps in the Engineering Design Process .

What do we need to cross?

How can we cross it?

What is it made of and how should it look?

Build a model

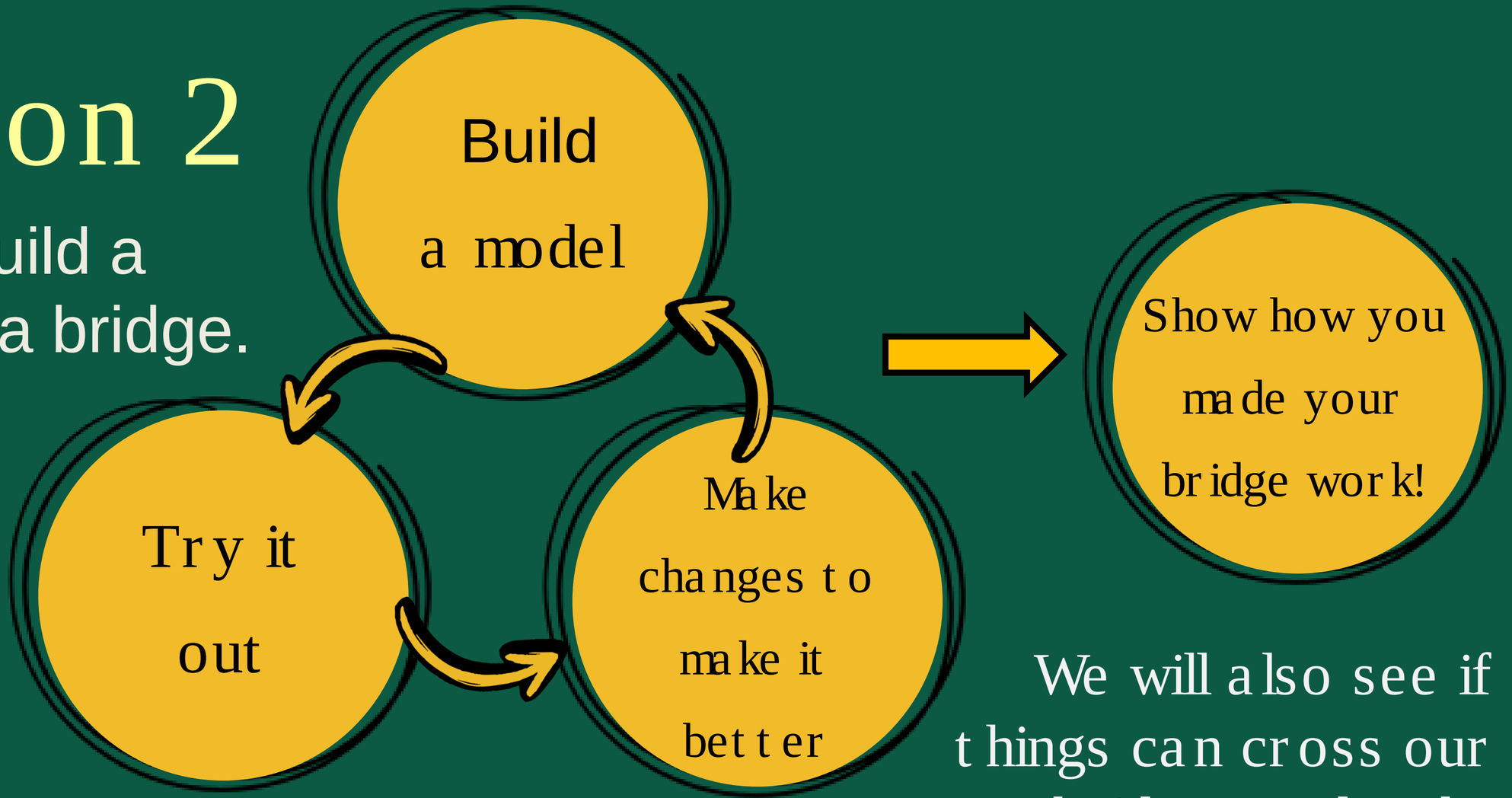
Try it out

Make changes to make it better

Show how you made your bridge work!

Lesson 2

We will build a model of a bridge.



We will also see if things can cross our bridges and make changes if they can't.

Remember our parts of a bridge...

Bridge Deck

This is the top of the bridge where people walk and cars drive.

Piers

These hold up the middle of the bridge.

Abutment

These anchor the bridge to the ground at both ends.

CHALLENGE

We are going to use the engineering design process to build a bridge.

We should be able to see all the parts of a bridge too including a bridge deck, piers, and an abutment. What part is missing from this picture?

Bridge experiment for K-1st grade

Materials

(2) Toilet tissue rolls

(3) Strips of cardboard (4 inches by 10 inches)

Blue paper to represent a stream

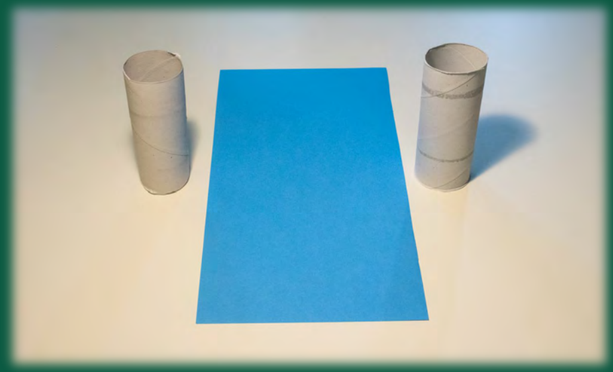
Tape

Toy car

Bridge experiment for K-1st grade

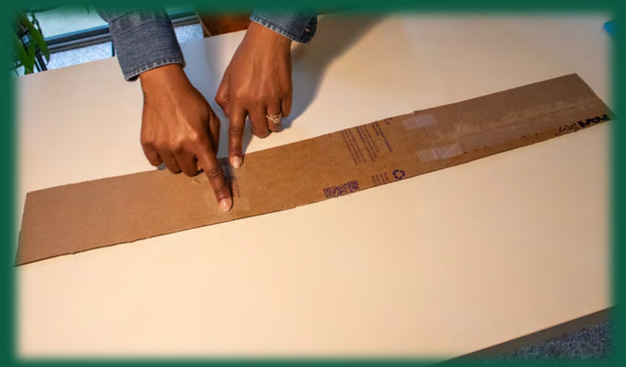
Instructions

1. Place the blue strip of paper on the table.



2. Place one toilet tissue roll on each side of the blue paper, “stream.” These will be the bridge piers.

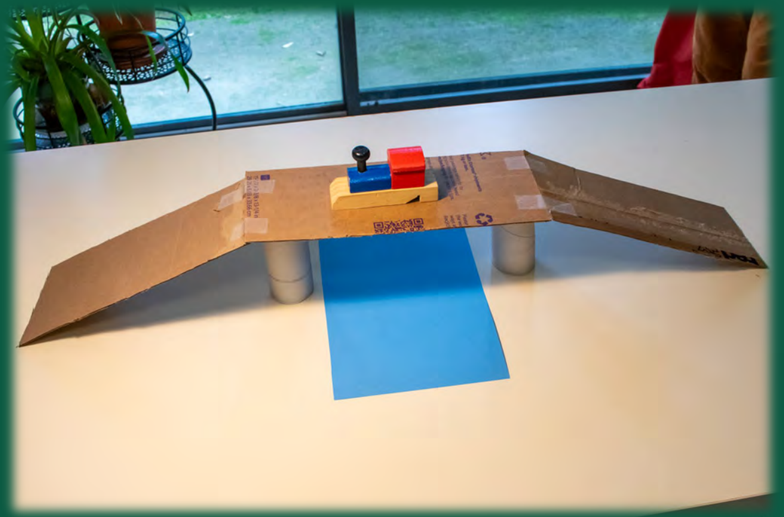
3. Tape the cardboard box pieces together lengthwise.



Bridge experiment for K-1st grade

Instructions continued

4. Place the toilet paper rolls under the bends in the cardboard strips. The middle strip will act as the bridge deck and the two side strips will act as the road leading up to the bridge.



5. Drive the toy car over the bridge to see if it holds up. If the bridge falls or bends, adjust the bridge to make it sturdier and try again.

Bridge experiment for 2nd-3rd grades

Materials

(2) Identical tissue boxes

Cardstock paper for the bridge deck

(1) Toy car

(1) Bag of 100 pennies

Notepad and pencil

Tape

(1) Narrow slip of plain paper with a road drawn on it.

Bridge experiment for 2nd-3rd grades

Instructions

1. Either print note chart or instruct students to prepare their notepad to have a chart with two columns and 12-20 rows below. One column should be titled “Bridge Design,” and the other should be titled “Observations.” You can also print out the one attached.

Bridge Design	Observations

You will need to record what type of bridge you used for each attempt under the “bridge design” column and describe what happened for each design in the “observation” column to track of what did or did not work.

This exercise will take multiple attempts.

Bridge experiment for 2nd-3rd grades

Instructions Continued

2. Place the two tissue boxes on the table about 6 inches apart.

3. Place the plain paper with the road drawn on it across the two containers and drive the toy car across.

What did you observe? What could we do differently next time?

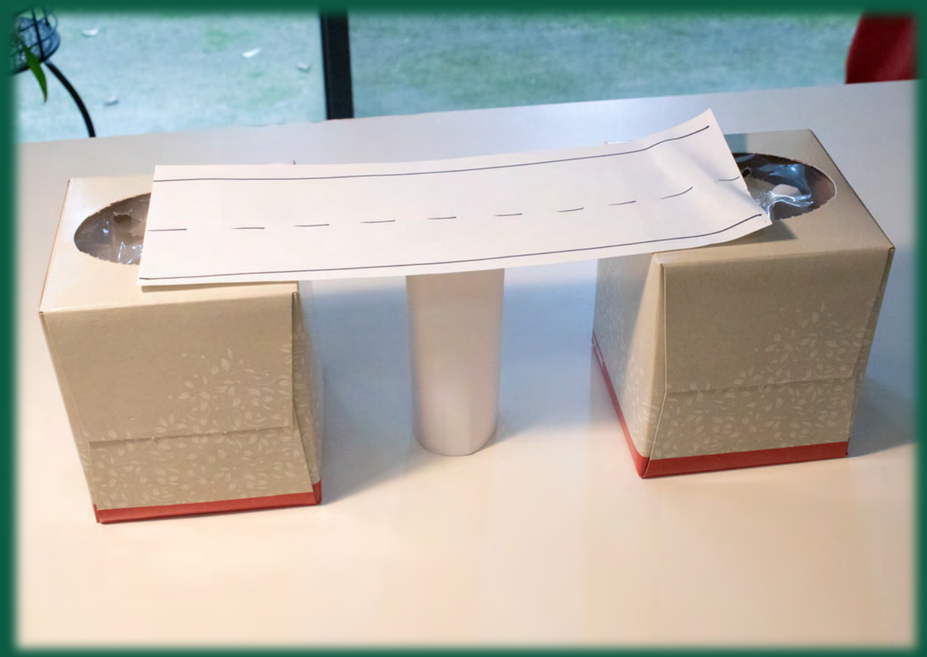
Bridge experiment for 2nd-3rd grades

Instructions Continued

4. Create a pier by folding a piece of cardstock into a ring and taping it.

5. Place the pier in the middle of the two containers and then place the paper road across the pier and the two containers.

Drive the car across.



What did you observe? What could we do differently next time?

Bridge experiment for 2nd-3rd grades

Instructions Continued

6. Fold a piece of plain paper (in half, lengthwise) and then bend it to create an arch. Place the arch between the two containers and lay the road on top.

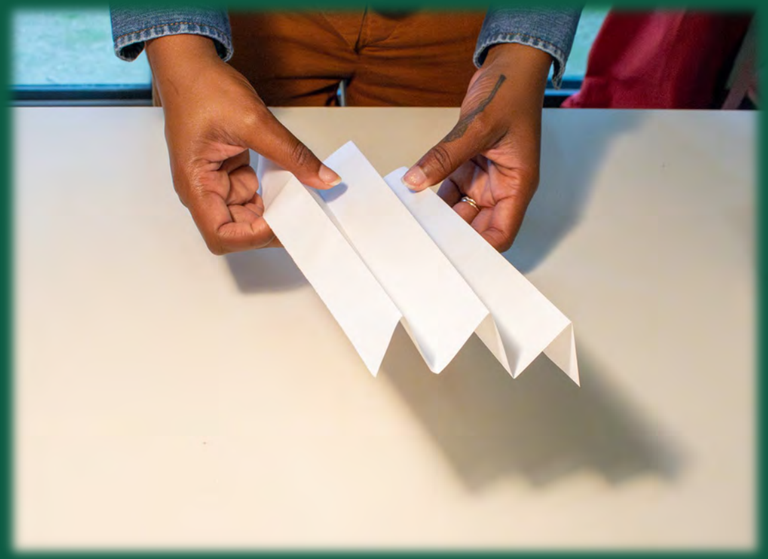
Drive the car across.

What did you observe? What could we do differently next time?

Bridge experiment for 2nd-3rd grades

Instructions Continued

7. Fold a piece of cardstock lengthwise to create zig zags or an accordion shape. This will represent one kind of Truss Bridge. Place this zig-zag paper across the two containers. Place the car on top of the zig zags.

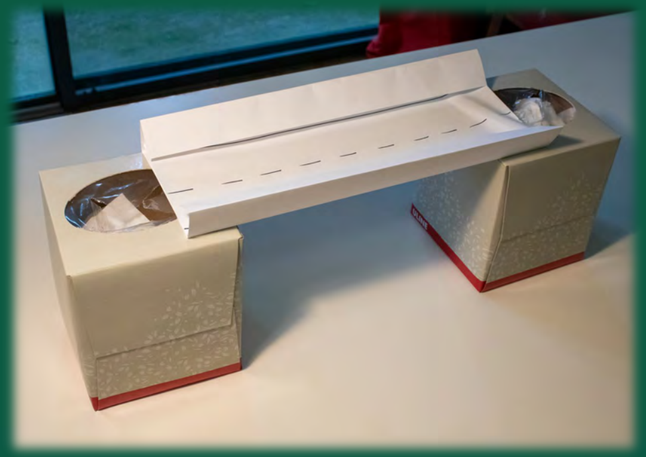


What did you observe? What could we do differently next time?

Bridge experiment for 2nd-3rd grades

Instructions Continued

8. Fold a piece of cardstock lengthwise to make two triangles on both edges of the paper. This will create a flat surface with two triangular walls and represent a bridge deck and railings. Place the road paper across the cardstock bridge deck and roll the car across.



What did you observe?

Bridge experiment for 2nd-3rd grades

Try on your own!

Repeat any of these steps or create new kinds of bridges that are strong enough to hold your bag of pennies.

Make sure to record your bridge designs and observations on your chart.

Congrats!

You have engineered a bridge!

Exit Ticket

How did you make a bridge using the engineering design process ?

Reference videos for the experiments follow.

Bridge Experiment for K to 1st Grade

Bridge Experiment for 2nd-3rd Grades.

There are bridge architects as well that design bridges.