



STEM Virtual Learning- IMPACT

2nd & 3rd Grade

Structural Engineering

Lesson 2: Bridges

April 13, 2020



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Learning Targets:
Students will...

- Understand force & constraints on building structures
- Understand challenges of engineers and the Engineering Design Process

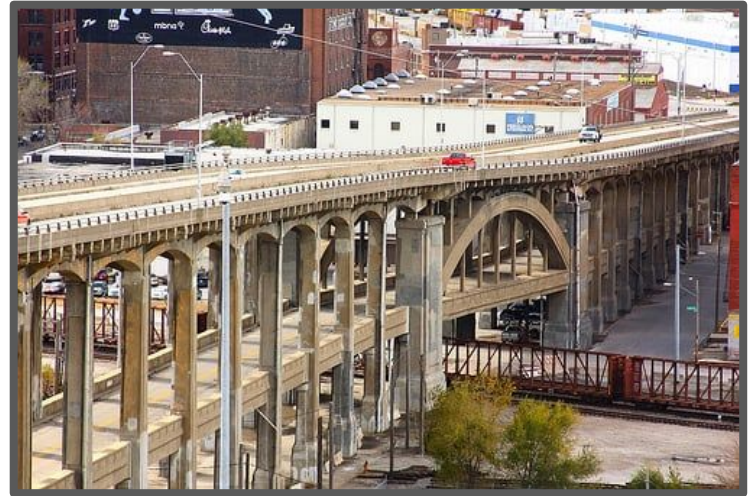
Background: This is a review lesson from 2nd Grade Civil Engineering

- Students learn the impact of force on designs
- Students learn about bridges
- Students learn to overcome challenges

Let's Get Started:

Watch & Read-

1. [Brief Introduction to Bridges](#)
2. [What Makes Bridges So Strong?](#)
3. [Bridge Basics](#)



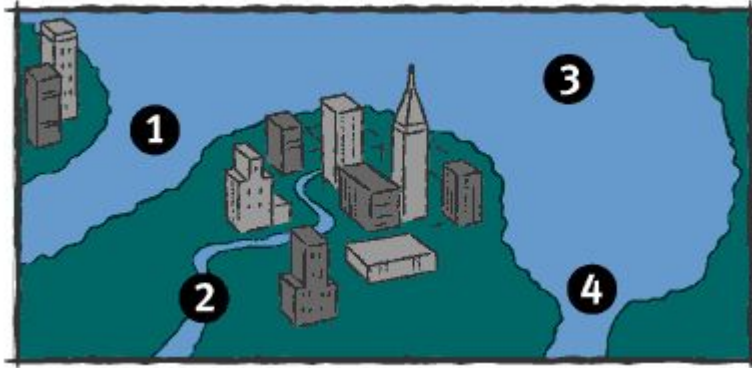
Bonus- Can you name the location of this bridge?

Monday-

Practices:

Click the link and complete challenges 1-4

The Bridge Challenge



Remember, *span* is the distance a bridge extends between two supports.

Monday-



Think
About It!

Can you list at least *four* things you learned from the practices?

Tuesday-

Practice on your own:
Go to this website and watch the video
[The Impossible Bridge](#)

- What was the challenge the engineers had to overcome?
- What are the 3 different types of bridges considered?
- Which type did they choose?
- Why?

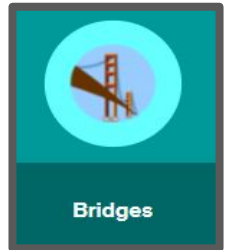


Tuesday-

MORE Practice on your own:
In BrainPop...

1. Click the link [Bridges](#)
2. Watch the *movie* and then complete the *quiz*.
5. For even more practice complete the *graphic organizer*.

Quiz!
Bridges



Tuesday-



Think
About It!

What are the three main types of bridges?

Let's Review:

- The main types of bridges built are beam, arch, and suspension.
- The weakest is the beam and the strongest is the suspension.
- Span is the distance a bridge extends between two supports.
- Compression is the force that presses material/ objects together.
- Tension is the force that pulls material/ objects apart or stretches them.
- Dead Load is the weight of a structure itself.
- Live Load is anything that applies more weight to the structure (not a part of the structure itself).
- Rectangles, arches, and triangles are the most common shapes used to build big structures.
 - ★ The triangle is the strongest.
- You can find more information at...
 - [Geometry of Bridge Construction](#)



Wednesday-



Think
About It!

Remember the picture of the bridge on the 3rd slide (the one in KC), what kind of bridge is it?

Wednesday-

Prompt:

Your employer loved the skyscraper you designed last week so they have decided to hire you for another job! You are being sent to Lake Michigan to survey the area for the first bridge to cross a Great Lake! To help with trade, there needs to be a bridge connecting Port Washington, Wisconsin to Whitehall, Michigan. Currently to go around the lake it is 324 miles and takes about 5 hours. A direct route would be about 75 miles in almost 2 hours. You will need to be sure to consider certain constraints in designing the bridge. The span, the depth of the water, and the weather will all play a part in being successful at this task.

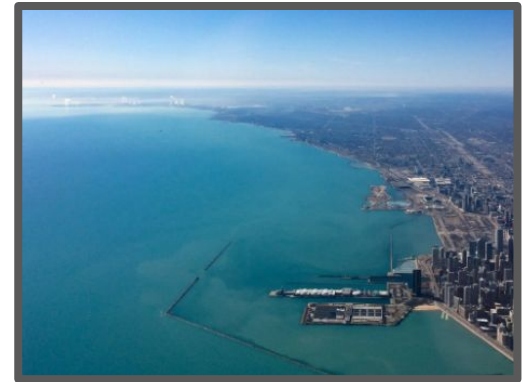
Good Luck!



Research

Before conducting your experiment your engineering team has decided that you need to research constraints you may face in construction. This will be the longest bridge the world has ever seen! Begin by watching this [video](#) on the current longest bridges, and then search the internet to find the answers to the questions below. Record your answers on a sheet of paper.

1. What is Lake Michigan's greatest depth?
2. What is Lake Michigan's greatest width?
3. What are the temperatures Lake Michigan faces?
4. Has Lake Michigan ever frozen in the winter?
5. Why are these important to consider in the design for your bridge?
6. Based off what you have learned, which of the three types of bridges would be the best for this construction? Why?
7. Draw your plan.



Lake Michigan shoreline

Thursday-

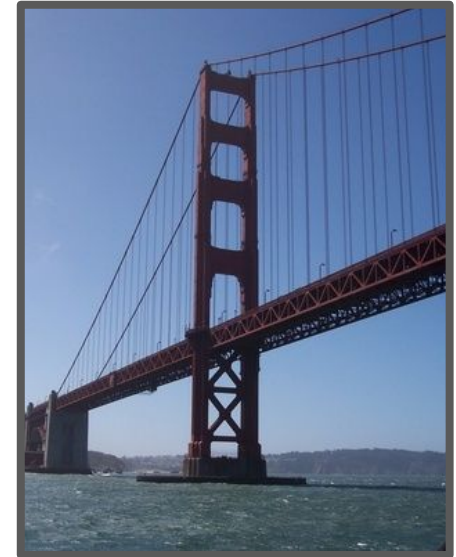
Project:

The Longest Bridge in The World

Build a bridge to use in a test of strength and stability.

Materials:

- Pennies/coins (or other objects for weight or the “live load”)
- Cardboard (cereal boxes open flat will work)
- Cardboard tubes (toilet paper, paper towel, or cardboard rolled and taped)
- Pencil
- Scissors
- Tape
- Ruler or measuring tape
- Paper to record results



Golden Gate Bridge

Thursday-

Procedure:

- Use the materials you have collected to create a bridge that spans your kitchen sink! The sink will serve as Lake Michigan.
- The bridge must span the entire sink from one side of the counter to the other.
- You may make supports out of cardboard to help hold up your bridge.
- Once the bridge is constructed take measurements.
 - Record-
 - How long is your bridge (from counter to counter)?
 - How wide is your bridge?
 - What is the height of the space between the bottom of the sink to the platform of your bridge?
- Begin placing coins (or other weight) at different areas on your bridge.
 - How much weight (live load) will it hold before bending or breaking?
 - What should you improve to make it stronger?
- **Extension-** After making any repairs to your bridge, add water to the sink.
 - Does this make a difference in the stability of your bridge?
 - Conduct the weight experiment again.



Thursday-

Self Check:



IMPACT students, make a video or report in Seesaw.

Answer the following questions-

- What did you find in your research about Lake Michigan?
- What kind of bridge would you use to span Lake Michigan and why?
- Describe your experiment.
- How many times did you have to make improvements to your design?
- From what you have learned, do you think it would actually be possible to build a bridge across Lake Michigan? Why or why not?



Friday Funday-

Origami

Follow the directions in this [video](#) to make an origami boat.

- Will the boat float in water?
- Would it be able to go under the bridge you made?



Friday
Funday-

MATH GAME OF THE WEEK!

Bridges

Instructions:

- Go to this [website](#).
- Construct bridges to connect the islands in this tricky logic game.
- Pay attention to the numbers to make sure the right numbers of bridges are connected to the islands.
- You must use logical thinking skills and a bit of creative reasoning to solve the puzzle.