



STEM Virtual Learning- IMPACT

2nd & 3rd Grade

Structural Engineering

Lesson 1: Skyscrapers

April 6, 2020



2nd & 3rd Grade STEM- IMPACT
Lesson 1: Skyscrapers
April 6, 2020

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 skyscrapers
- Students learn to overcome challenges

Let's Get Started:

Watch & Read-

1. [How High Can Skyscrapers Go?](#)
2. [Skyscraper Basics](#)



Bonus- Can you name the city in this landscape?

Monday-

Practice #1:
Click the link below

Complete challenge:
["Location 1: Fire in Chicago"](#)

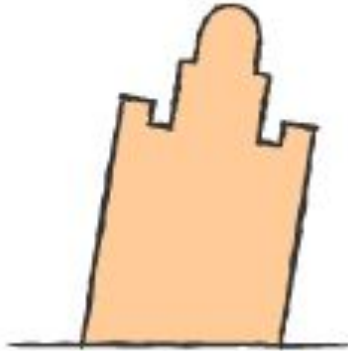


**Remember, *compression* is
the natural force that
presses objects together.**

Monday-

Practice #2:
Click the link below

Complete challenge:
[“Location 2: Sinking Cathedral in New York”](#)



Remember, *constraints* can be limits on budget, time, materials, location and/or requests of the contractor.

Monday-

Practice #3:
Go to click the link below

Complete challenge:

[“Location 3: Potential Building Collapse in Los Angeles”](#)

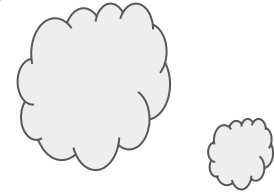


Remember, one of the most important parts of the Engineering Design Process is making improvements until its the best it can be.

Monday-



Think
About It!



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

Tuesday-

Practice on your own:

Go to the website:

[PBS Lab](#)

1. Choose a **load** from the menu on the left to see how it affects big structures.
2. Click “Try It” and see what happens.
3. Click “Strengthen It” and see if you can make the structure more stable.
4. Explore the different tabs at the top-
forces, loads, materials and shapes.

Tuesday-

INTERACTIVE *SkyscraperMaps*

MORE Practice on your own:

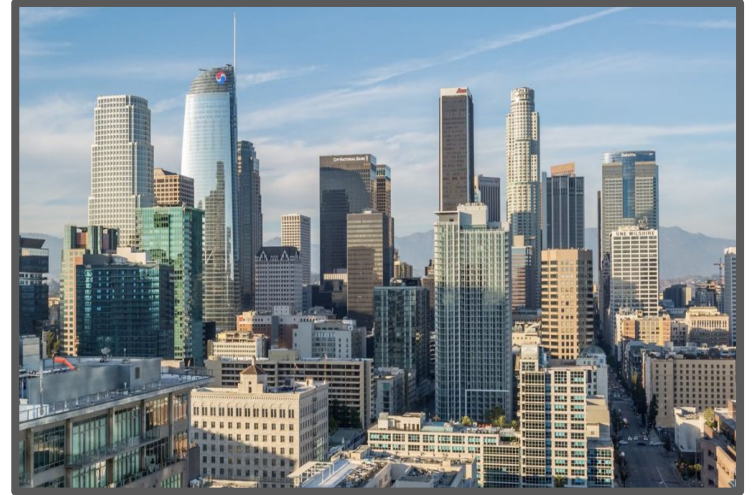
Go to this [website](#)

1. Explore the webpage.
2. Buildings marked on the map can be clicked to open their information page.
3. Do you see patterns in where certain skyscrapers are built?

Wednesday-

Prompt:

You have just been hired for your first job as a structural engineer. How exciting! Your first assignment is to go to Los Angeles, California and build the biggest skyscraper the city has ever seen. Unfortunately, through your research you found that CA is on the top 10 list for the state with the most earthquakes in the USA. You have to build a skyscraper that will withstand any natural forces that come its way. You talk with your team and decided that before you build, you need to run a few tests. Complete the following practice and record your results.



Wednesday-

Project:

Earthquake City Simulation

Build a city to put through a simulated earthquake to show the damage earthquakes can cause to buildings. Think about what you know about skyscrapers including materials used, loads, and natural forces.

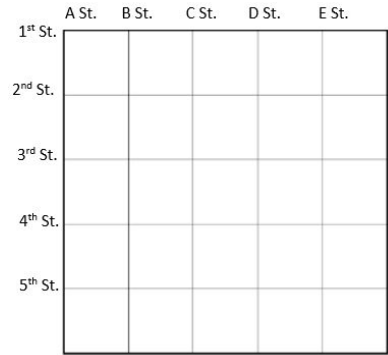
Materials:

- **three different** building materials (examples could be small building blocks, pennies or other coins, and small toys that can stack)
- Large piece of cardboard
- Pencil or marker
- Ruler or measuring tape
- Paper to record results



Procedure:

1. Create a grid on the cardboard by drawing five vertical lines and five horizontal lines evenly spaced apart.
**Reminder- vertical is up/down, horizontal is side/side.*
2. Label the vertical lines **1st St**, **2nd St**, **3rd St**, **4th St**, and **5th St**.
3. Label the horizontal lines **A St**, **B St**, **C St**, **D St**, and **E St**.
4. Build your three structures (one from each material) spaced apart at different intersections of the grid.
5. On your paper record the material, how tall (measure with ruler), and the street location for each building. Example: *building blocks, 5 inches, 2nd St. and D St.*
6. Simulate an earthquake by tapping the corner of the cardboard. Continue tapping until at least part of a structure falls.
7. Record which skyscraper fell first.
8. Move building locations. Run the test again and record results. Do this two more times.
9. Try making the buildings that do not fall taller. Run test again and record results.



Wednesday-



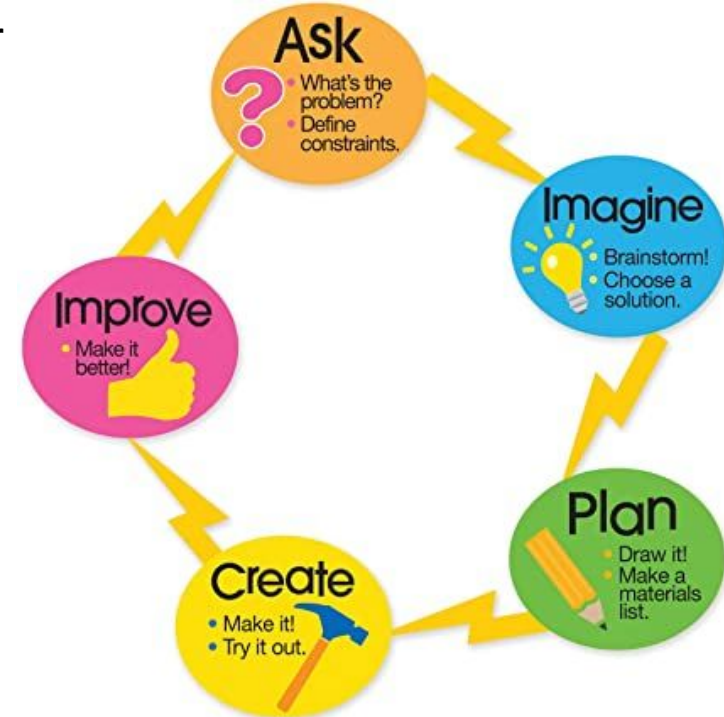
Think
About It!

**Did the location or material make a
difference in your results?**

Thursday-

Report:

- Write a report to the city officials explaining why you should build your skyscraper in a certain location within the city of Los Angeles. Use your experiment as evidence.
- Think about the *Practices* you did earlier. What materials will you use to build your skyscraper? Why?
- Review the Engineering Design Process and explain how it helps engineers create better designs.
- Share your report to a parent (the “City Official”) and see if you can sell your idea to them. Do they approve your build?
- **Extension-** Try using more materials to build an entire city. Try the earthquake test again to see which buildings stay standing.



Self Check:



In your report did you...

- Explain which location would be the best for building a skyscraper
- Use your experiment as evidence
- Explain which materials would be best to build a skyscraper
- Explain how the Engineering Design Process helps engineers
- Share your report
- Get your build approved
 - If not, what could you improve or change to get it approved?

Friday Funday-



IMPACT students, if you'd like to share with us, ask a parent to help you upload a video or picture of your city simulation and report to Seesaw. Look for the email we send with the QR code to login.

Friday Funday-

MATH GAME OF THE WEEK!

The 100 Game

Rules:

- Two people play this game. Decide who will go first.
- The first player calls out a whole number between 1-10.
- The second player calls out a larger whole number, but no more than 10 larger than the previous number.
- Players take turns calling out larger numbers, never adding more than 10 to the previous number.
- Whoever calls out "100" first wins!

Ex: I call 4, the other person calls 12. I call 16, the other person calls 20.
And so on until someone reaches 100.