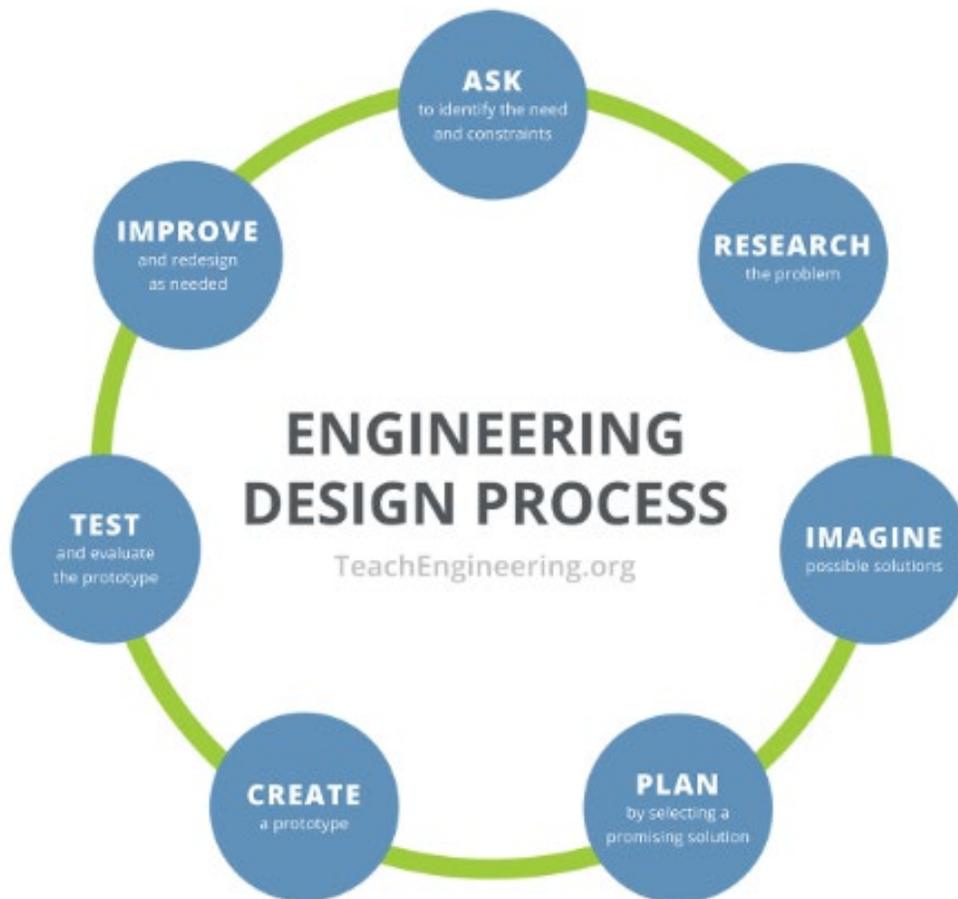


Design Challenge: Exploring the “E” in STEM: Bridge for Teachers and Caregivers

Activity Description:

This activity aims to engage students in learning more about the “E” in STEM. Students will learn more about the role of engineers and what their work entails through the process of designing and building a bridge. Students will use everyday items like paper, tape, toothpicks, cardboard tubes, books, and more to build a bridge with some constraints. By using the steps in the [engineering design process](#) students will better understand why and how engineers test their own designs for real world bridges using small scale models.



Key Concepts learned from this activity

- What kinds of problems do civil engineers solve?
- How do engineers evaluate their designs through testing?

Answer key for questions to test student understanding:

Q: What is the role of an engineer and why is their work important?

A: Student answers can include: The role of engineers involves problem solving and designing. Their work has value to us because it offers new solutions to our problems in different fields.

Q: What are some questions engineers might ask themselves?

A: *Student answers can include:* Engineers ask themselves what problem needs solving, who has the problem, and why is it important to find a solution.

Q: What shape works best to build a strong bridge?

A: Student answers should say: Triangles work best to create a sturdier structure.

Q: What forces act on a bridge?

A: Students can include: Tension and compression, or pulling or pushing force, respectively.

Q: Why do you think it is important for engineers to build a small-scale model of their design first? What are some factors they must take into account?

A: Student answers should demonstrate that: By building small models engineers can test their ideas at a low-cost, keeping in mind the limitations they have been given. Such factors can include making a structure, cost-effective, sturdy, and weather-resistant, among other answers.

Q: What kind of bridges are shown? Of the two bridges, which do you think would support heavier traffic?

A: Student answers should say: The left bridge is a suspension bridge. The right bridge can be described as an arch bridge/truss bridge combination. The addition of more triangles on the bridge on the right allows the bridge to support heavier traffic.

Randall's Island Park Alliance

*The bridge on the left is the East River suspension bridge at Randall's Island, part of the Triborough bridges. The arch/truss bridge on the right is the Hell Gate bridge. Both bridges connect Queens to Randall's Island.



Vocabulary:

Engineers: A person who designs and builds machines, structures and systems to solve a problem.

Civil engineers: Work to design structures used for transportation, buildings or moving our water supply.

Tension: a pulling force that acts to expand or lengthen the thing it is acting on.

Compression: a pushing force that acts to compress or shorten the thing it is acting on.

Additional Resources:

<https://www.teachengineering.org/k12engineering/designprocess>

<https://www.lcps.org/cms/lib/VA01000195/Centricity/Domain/5867/BridgeDocs.pdf>

<https://mesa.ucop.edu/wp-content/uploads/2017/11/2.6-Bridge-Building-Bridges-The-Basics.pdf>

<https://randallsisland.org/timeline/>

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