



FIRST[®] at Home Activity

Bridge Design

PROBLEM STATEMENT

Bridges have been around for thousands of years. Today, architects design beautiful and functional bridges with unique features that reflect a city, its culture, and its geography and climate. They have to find a balance between the beauty, form, and function of their designs.

Choose your favorite place in the world! Think about where you could design a bridge in this place. Will it be across water or land? Who will use this bridge? What will be its purpose? What will it look like? How does the local culture influence what the bridge looks like? Create an artistic, unique, and innovative bridge that is also structurally sound.

CRITERIA & CONSTRAINTS

- Bridge design must consider form and function for its intended purpose.
- Bridge should be designed for location's geography, climate, culture and terrain.
- Drawing should include supports and land/ water features on either side of the bridge.
- Drawing should be detailed and contain all relevant information and could be drawn to scale on graph paper.

ENGINEERING DESIGN PROCESS & FIRST CORE VALUES

[FIRST[®] Engineering Design Process](#) | [Explore FIRST Core Values](#)

BUILDING THE BACKGROUND

Reflect, research, and answer the questions below.

1. What are the main parts of a bridge?
2. What are the different types of bridges?
3. How were early bridge structures created and what materials were used?
4. What technological advances have there been in bridge CAD design and simulation?

ACTIVITY STEPS

1. Brainstorm how you will design your bridge structure. Sketch your ideas on a separate sheet of paper.
2. Choose your favorite bridge design. Create a detailed 2-D and/or 3-D drawing of your bridge design on a separate sheet of paper. Label and describe the following on your drawing:
 - Bridge type
 - Bridge place and location
 - Building materials
 - Estimated cost
 - Bridge form and function
 - Bridge style and features
3. Optional: Create your bridge design as a computer-aided design (CAD). Here are some free CAD resources:
 - The Bridge Designer <http://bridgedesigner.org/download/>
 - SolidWorks Apps for Kids <https://beta.swappsforkids.com/#/>
 - Autodesk Tinkercad <https://www.tinkercad.com/>

REFLECTION QUESTIONS

1. Why did you choose your place and location for your bridge?
2. How was your bridge design unique and innovative?
3. How did others in your team/ class design their bridges?
4. How did you ensure bridge design was structurally sound?
5. What skills did you use or learn in this activity?

GO FURTHER!

- Build a model of your bridge design using materials you have at home. These could include paper, spaghetti, wood, toothpicks, straws, or any other supplies.
- Examine what forces act on your bridge by placing different objects of the center of the bridge until it fails, pennies or other coins can be used as weights.

CORE VALUES SELF-REFLECTION

	Amazing Skill	Great Job	Making Progress	Could Be Better
Discover	I approached the tasks looking for all possible answers independently and used perseverance to discover the answer on my own.	I approached the tasks and asked questions from one other person but persevered to discover the answer on my own.	I approached tasks but needed assistance multiple times to reach a point of discovery.	I depended on others to make the discovery for me.
Innovation	I used creativity and perseverance to solve problems on my own, coming up with unique solutions for the tasks I was given.	I used creativity and perseverance to solve problems on my own coming up with different solutions for the tasks I was given.	I used creativity but struggled with perseverance to solve problems on my own.	I struggled with being creative and only used the information given and needed a lot of encouragement from others to complete the task.
Impact	I approached the tasks applying understanding of the information with the impact it can have on me and my future as well as how I could help others.	I approached the tasks knowing and applying the information with impact it can have on me and my future.	I understand the tasks but struggle to apply how it will help me in my future or to influence others.	I understand the tasks but did not approach it with understanding the impact it can have on my future or others.
Inclusion	I approached all tasks with inclusion of others' ideas, I showed tremendous kindness by including others' views in my projects and work. I approached my solution thinking how all people would interact with the solution.	I approached most with inclusion of others' ideas, I tried to understand others' views and include them in my projects and work. My solution mostly incorporates needs of others.	I approached some tasks with inclusion of others' ideas, I tried to understand others' views and include them in my projects and work. My solution meets only a few needs of others.	I did not approach tasks with inclusion of others' ideas, I tried to understand others' views and include them in my projects and work. My solution is not inclusive of different types of people.
Teamwork	I used collaboration, communication and project management to get all tasks accomplished for myself as well as the others.	I used collaboration, communication and project management to get most tasks accomplished for myself as well as the others.	I used collaboration, communication and project management to get some tasks accomplished for myself as well as the others.	I only sometimes used collaboration, communication and project management and accomplished a few tasks for myself as well as the others.
Fun	I kept a positive attitude throughout and found opportunities to have fun even through struggle. I looked for additional opportunities to have fun in my tasks.	I kept a positive attitude throughout and found opportunities to have fun even through struggle.	I saw the enjoyment and fun after the activity but struggled to see it during.	I only saw struggle in completing my tasks and did not look for times to have fun.