

Instructor's Notes

Building Bridges

Becoming aware of how bridges affect our lives will increase your students' awareness of the built environment. They will begin to realize how much people rely on bridges to move about.

Subjects: Science, math, writing, social studies, reading, critical thinking, work skills, and life skills

Activities:

1. Develop awareness of bridges. Ask students to think about the last time they remember crossing a bridge. Where were they? How were they traveling—on foot, by car, bicycle, bus, or train? Ask them what their impressions were. Did they notice the bridge itself? Have students collectively create a definition of the word “bridge”. With the class definition in sight, talk about obstacles that bridges can span. Usually people think of bridges as structures spanning water, but there are numerous other obstacles. Ask students to brainstorm a list.
2. Bridges, like all built structures, rely on unseen forces that hold them together and enable them to support additional weight, or loads. It can be difficult to visualize forces acting on an object or structure that appears to be at rest. Complete [*Understanding Forces at Work*](#) for a better understanding of forces.
3. Building with inherently weak materials like paper quickly leads to a close consideration of the structural elements and properties of materials. There is an element of surprise, which increases students' interest in the physics, when they discover just how strong they can make this seemingly flimsy material. Complete [*Paper Structures*](#).
4. Bridges are structures which carry people and vehicles across natural or man-made obstacles. There are many types of bridges. Bridges are shaped differently and use a variety of materials depending on the length of the barrier to be crossed, the amount and type of traffic, and the forces of nature (wind, tide, flood, ice) which will impact it. Complete [*Bridge Over Troubled Water*](#).
5. Suppose all the bridges in a large city (Chicago, for example) were closed. What effect would that have on that city? What impact might it have on the economy, i.e. getting to work, getting/making deliveries, etc.? What are some specific ways that people would adapt to not using bridges? Write a paragraph telling your viewpoints.
6. Can paper towel or toilet paper rolls be the piers for a truss bridge? Can oatmeal canisters or Pringles cans be transformed into arches for a bridge? Can plastic shopping bags become the cables on a suspension or cable-stayed bridge?

Have a class discussion on how to Reduce, Reuse, Recycle and then challenge students to construct a bridge using only recycled materials. Using recycled materials helps promote creativity and individuality, helps preserve the natural environment, encourages students to take ownership of their projects, and, best of all, they are free!

7. Many bridges are icons for their city or region. Why do you think people associate certain bridges with certain cities, while other bridges seem unremarkable? Look in magazines, newspapers, and online to find famous bridges. What bridges are you familiar with and where are they located? What bridges have you seen in movies, (i.e. Bridges of Madison County), TV, magazines, etc? What are icons? What are some local icons?
8. Divide the class into groups. Have each group read the handout on bridges (found in Activity #9) entitled, [Building Bridges: The Basics](#). Using the [Venn diagram](#), compare and contrast a Beam Bridge and an Arch Bridge. List at least three ways they are similar and three ways they are different. Put the facts that are only about Arch Bridges into the left circle. Put the facts that are only about Beam Bridges right circle. Put facts that are common to both in the center. Use a transparency of the Venn diagram to write the answers of all the groups on it.
9. Using the Building Bridges: The Basics handout as a resource, discuss how each of the three basic types of bridges—suspension, beam, and arch—transfers loads from the bridge to the ground. Describe where tension and compression occur on each type of bridge.
10. Many bridges are symbols for the cities or regions in which they are located. Almost everyone associates the Golden Gate Bridge with San Francisco or the Brooklyn Bridge with New York City. Have your students prepare posters or multimedia presentations on famous bridges from around the country and world. Students should include in their presentations, descriptions of the designs and features of the bridges, including pictures or diagrams and brief descriptions of the areas in which the bridges are located. They should also include brief histories of how and why the bridges were built and the current uses and states of the bridges, including any repair plans. You could include any famous cultural references to bridges, like quotes from poems and/or songs (“London Bridge is falling down,” for example).
11. Does a career as a bridge builder or welder sound interesting to you? Construction is one of the largest industries in the world. Construction workers build our bridges and roads, our places of employment and entertainment, our schools, and our homes. More than ever, we need skilled, trained and dedicated workers to maintain the high level quality that goes into each construction project. Our nation needs more than 240,000 new skilled craftspeople each year just to keep up with demand! Why are careers such as Bricklayers, Steel Workers, Tool & Dye Makers, Heavy Equipment Operators, Concrete Finishing, Carpentry,

Electrical Wiring, Power Tools, Computer-Aided Drafting (CAD), Drywall Finishing, Painting, and Landscaping so rewarding? What other careers would be construction related? Have students brainstorm a list of careers and then research the one that appeals to them the most. Have students complete the [Career Information Worksheet](#) and discuss.

12. [Bridges to Math](#)--Students will collect bridge statistics to use for measurement calculations and comparisons.
13. Engineers test the materials used in construction of buildings, roads, bridges, etc, for durability, strength, and safety. Testing models gives them the information in a manageable, cost efficient manner. Complete [Spaghetti Bridges](#) that simulates the procedure used in testing the strength of bridge beams.

14. Music is a bridge to creativity. Just listening to music can get the creative juices flowing. Music is also one of the Multiple Intelligences described by Howard Gardner. Those who are strongest in this intelligence may learn best or memorize information using songs or rhythms and may work best with music playing in the background. Find songs about bridges. Play them for the class. You can discuss the mathematical elements of music, create movements for the songs, or draw what the music makes them think of. Ask the students to write about why bridges are used in poetry and songs. What could bridges represent in their lives? Some songs about bridges are: London Bridge is Falling Down, Bridge Over Troubled Water by Simon and Garfunkel, Burning Bridges by Donny Osmond, Burning Bridges by Garth Brooks, Water and Bridges by Kenny Rogers, Love Can Build a Bridge by Naomi and Wynonna Judd, Ode to Billy Joe by Bobbie Gentry, Misty Morning, Albert Bridge by The Pogues' (Albert Bridge is a bridge across the Thames river.), The 59th Street Bridge Song (Feelin' Groovy) by Simon and Garfunkel (This bridge links Manhattan with Queens.), Floating Bridge by MC Frontalot is literally about different types of bridges (lyrics at <https://frontalot.com/lyrics/MC-Frontalot-Lyric-Floating-Bridge.html>)
15. [***Where in the World—American Bridges***](#) will engage your students' reading, writing, math, and geography skills.
16. To develop print-based vocabulary skills and practice applying those skills to make text more meaningful, complete [***Reading: Bridging the Vocabulary Gap***](#).
17. Transitions are words or phrases that are like a bridge between ideas. They keep the reader from getting lost and confused. Have students complete [***Building Bridges with Transitions—A Writing Activity***](#).
18. Develop computer skills by completing the [***Scavenger Hunt***](#).
19. For more ideas on bridges, check out the [***Websites for Bridges***](#).