



Nature Play: Bridges Engineering Challenge

Engineering Challenges: Bridges

Children are natural engineers. They ask themselves; how can I do this? What happens if I change this? What can I do next? STEM (Science, Technology, Engineering, and Math) activities tap into this natural curiosity and desire to understand. The natural world is an immediate, constantly changing, and endlessly stimulating source for STEM activities.

One challenge children naturally address is how to get across a stream, gully, or some other gap that is too far to jump. The most common solution is to build a bridge. Bridges can be simple steppingstones or fallen logs, or complex structures like those crossing the Chicago river. Challenge children in your life to build life-sized bridges that will support their weight or smaller bridges that support the weight of a few pennies, stones, or toys.

Motivating Questions: How can we get from one side to the other? What materials can we use? Is it strong enough? How can we test it?

NOTES for Grownups: Adults can help support children's natural curiosity by switching from "Why?" questions to "How?" or "What?" questions. "Why" questions can suggest there is a right answer and a wrong one. "How" and "What" questions address process and observations.

Letting children learn from their mistakes is important to their mental and emotional development, specifically helping them build resilience and confidence.

The structured activity below is geared towards elementary age children. Younger children may need more assistance or prefer to address the challenge as real-world experiences.

Materials: Natural materials collected from your yard or a walk through your neighborhood (sticks, leaves, pinecones and other seed pods, tree bark, shells, etc.). A quiet place to build. A real or created obstacle to cross (a ditch, two stacks of books or two pieces of furniture).

Directions to Build a bridge:

- Ideally you can find a gully or some other depression and can build a real bridge. If you don't have access to a stream or gully, you can create one at home.
- If building a bridge at home, everyone to decide what counts as success or failure. For example, how long does the bridge need to be? How much weight does it need to support, if any? A toy car, a stick person, a real person?
- What other constraints will you impose on the bridge? Can any part of it touch the bottom of the "river"? Can you gather more materials if you use up all your original materials? For more advanced bridge builders, do you limit them to a single kind of



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bridge (truss, arch, suspension, cable-stayed)? Decide if you want to research different types of bridges or dive in!

- Find or make a gap to cross. If making a gap, start with one about 10- to 12-inches. This gap can be between two pieces of furniture or two piles of books, two tree stumps, etc.
- Divide into teams or have everyone design and build their own bridge.
- Gather materials to use to make a bridge. These can be sticks, stones, leaves, whatever you have on hand. You can also gather (or exclude) materials to hold the bridge together (tape, glue, clay/mud, string, rubber bands, long pieces of grass, etc.)
- Have each person, or each team, design their bridge and make predictions about what will happen to their bridge once it is complete.
- When the bridges are finished, begin adding weight. Start with your pre-determined objects (toy car, stick person, real person), and then add weight. Can you get it to collapse?
- Which bridge held the most weight? What worked from a design perspective? What didn't work? How would you do it differently next time?

For more information about STEM and STEAM:

<https://naturalstart.org/feature-stories/engaging-children-stem-education-early>
<https://educationcloset.com/steam/what-is-steam/>

Websites to explore bridges:

<https://srct21642.weebly.com/bridge-building.html>
<http://preschoolpowolpackets.blogspot.com/2016/02/outdoors-stem-build-bridge.html>
<http://blog.discoveryeducation.com/blog/2016/03/23/bridges-stem-challenge/>
<https://www.busykidshappymom.org/unplugged-play-build-bridge-challenge/>

For more information about engineering and engineering ideas:

<https://littlebinsforlittlehands.com/toddler-stem-activities/>
<https://mommyuniversitynj.com/2014/07/16/build-create-play-the-benefits-of-playing-with-building-toys/>

To explore the effects of failure, here are two books for adults, and for children.

Jessica Lahey (2015) *The Gift of Failure: How the Best Parents Learn to Let Go So Their Children Can Succeed*

Wendy Mogel Ph.D. (2008) *The Blessing of a Skinned Knee: Using Timeless Teachings to Raise Self-Reliant Children*

Andrea Beaty (2013) *Rosie Revere, Engineer*



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Web Images of Engineering Challenges: Bridges!

