Bridging the Gap: Activity Guidance

Learning objectives

By the end of this activity, young people will be able to:

• Apply core engineering concepts such as tension, compression, and structural strength in a practical context.
• Solve problems creatively by designing and adapting a bridge using limited materials.
• Work collaboratively to plan, build, test, and refine a structure within time constraints.
• Understand how shape and material choice affect load-bearing and structural performance.
• Reflect on the design and iteration process through testing and evaluation.
• Communicate and present design decisions effectively to peers.

Suggested resources

Main Building Materials (Core set – provided)

- Lolly sticks – the primary structural material for building the bridge.
- Bulldog clips – allow for quick and secure joints.
- Clothes pegs – helpful for clamping or connecting parts temporarily.
- Tray – acts as the canal and sets the span for the bridge challenge.
-

Note: For extended sessions or more advanced groups, consider offering optional extras such as string, masking tape, or cardboard strips to explore different joining and strengthening methods.

Testing Materials

Cans (or similar items) – to test bridge strength by gradually adding weight.
Toy canal boat or cardboard cutout – used to check if the bridge allows clearance underneath.
Stopwatch or timer – to manage build and testing phases.

Optional: Use a ruler or tape measure to compare bridge lengths, heights, or load-bearing capabilities.

Activity timing 45 to 60 minutes

Task brief

Your challenge is to design and build a bridge that spans a canal tray, allows a canal boat to pass underneath, and supports as much weight as possible (and at least one can) using only the materials provided.

- You will work in teams to plan, build, test, and improve your bridge. You'll be judged on two things:
- Structural integrity – how much weight your bridge can hold.
- Creativity in design – how innovative and aesthetic your bridge looks.

You're the engineers today!

Design & First Build Phase (20 minutes)
Teams plan their design (sketching optional) and build using:

Volunteers or teacher circulate, prompting with:
- "How are you supporting the middle?"
- "Will your bridge hold at both ends?"
- "What shape is strongest here?"
- "Does your bridge allow a boat to pass underneath?"

Preliminary Testing (5 minutes)
Each team places their bridge across the tray.
Begin testing by adding one can at a time to the centre.

Observe and ask:
"Where does the bridge bend or fail?"
"Is there tension or compression?"
"What could you do to strengthen it?"

Modify & Improve (20 minutes)
Teams return to improve their design based on test results.
Encourage creative fixes and collaboration.

Final Testing & Presentations (10–15 minutes)
One by one, test each bridge to maximum load.

- Teams present their bridge and explain:
- Their design choices
- What changed after the first test
- How they tackled challenges (e.g. height, weight, balance

Judges assess both:

Maximum weight held

Creativity / innovation in structure

Canal & River Trust | STEM

Testing criteria

Strength Test
- Add weight carefully in the centre of the bridge.
- Observe for compression and tension in different parts.
- Look for signs of buckling, shifting or collapsing.

Design Evaluation
- Does the boat pass underneath safely?
- Is the bridge wide and stable across the canal?
- What is the maximum load it held?
- How innovative or aesthetic is the final structure?

Suggested Evaluation Criteria
Structural Integrity: Did the bridge support a significant weight? Were strong shapes used?
Creativity in Design: Is the bridge visually unique, well-constructed or inventive in structure?
Problem-Solving: Did the team identify and solve structural weaknesses effectively?
Team Collaboration: Was the team organised, communicative and fair in their collaboration?

Plenary Discussion
- What shape made the biggest difference to your structure's strength?
- Which material was most useful — and why?
- What would you change if you had more time or different materials?
- In the real world, how do engineers decide what materials and shapes to use?

Curriculum Links
KS3 Science & Design and Technology
- Forces and structural integrity
- Working scientifically: planning, testing and evaluating
- Design thinking and iteration

KS4 Physics / Engineering / D&T
- Forces and stress distribution
- Engineering principles and material properties
- Problem-solving and analysis through iterative design