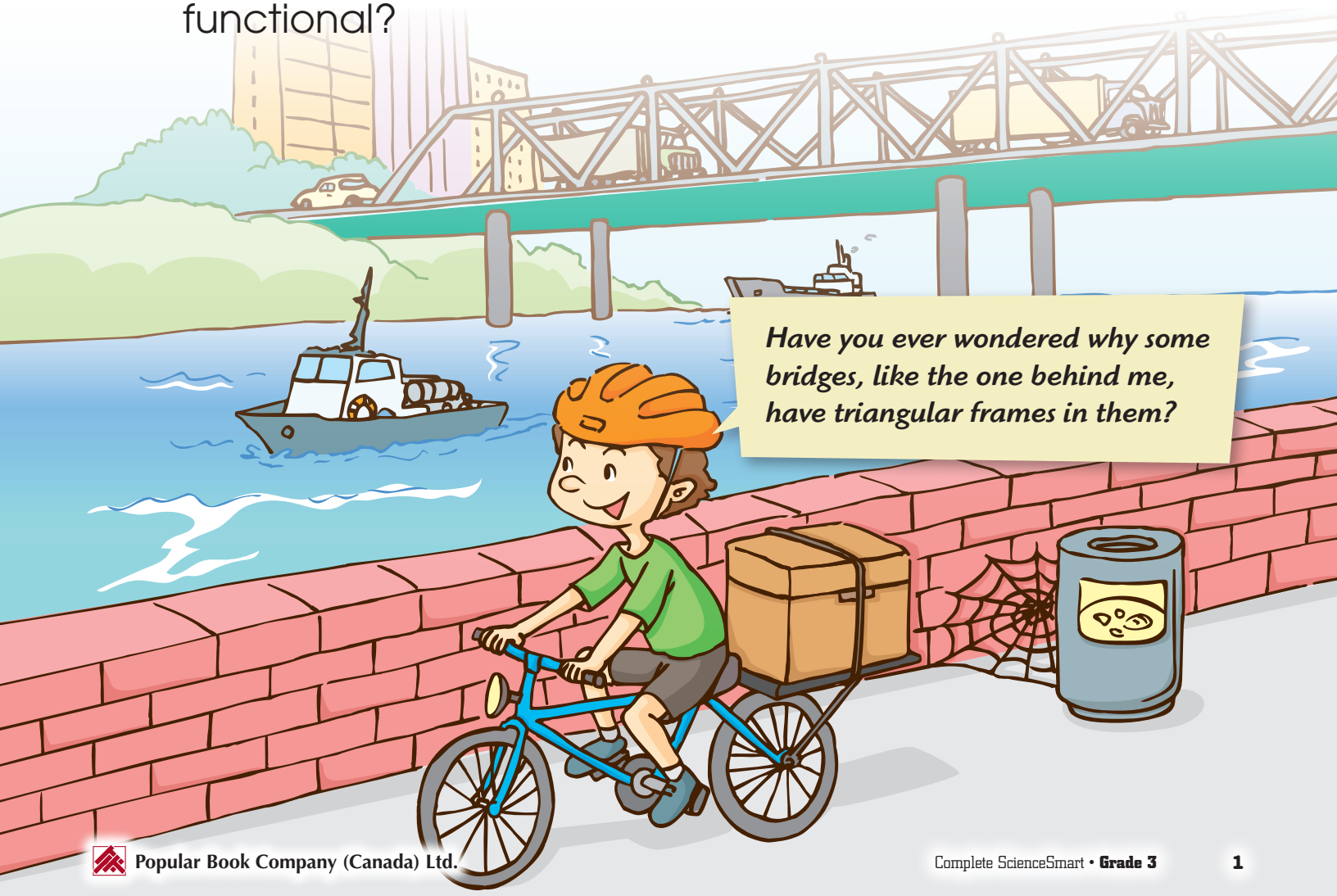
EXPLORATION 2

The Strongest Design

Explore how design affects structures.

Designing a structure that is safe to use is no easy task. Structures such as bridges are needed to help us get across gaps or water. They must be strong enough to support their own weight and that of the people and vehicles crossing them. Therefore, engineers use special materials with specific characteristics and properties to build different types of bridges that meet our needs. Apart from materials, engineers use many structural designs to improve the strength and stability of bridges. What design makes bridges safe and functional?



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Level of Difficulty:	easy
Time Needed:	1 hour

In this experiment, you will build bridges of different designs and compare their strengths.

Hypothesis:

Circle the words to show your hypothesis.

A truss bridge is **not as strong as / stronger than** a beam bridge.

Materials:

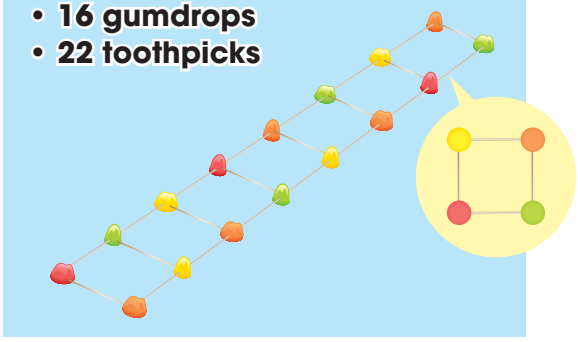
- gumdrops
- a ruler
- toothpicks
- pencils
- books

Steps:

1. Set up the beam bridge and truss bridge as shown.
2. Create a 5-cm gap by placing two stacks of books of the same height.
3. Place and centre the bridges on top of the two stacks of books. Then observe. Do the bridges droop or lose their shapes?
4. Increase the gap to 10 cm and observe again.

Beam Bridge

- 16 gumdrops
- 22 toothpicks



Truss Bridge

- 30 gumdrops
- 69 toothpicks

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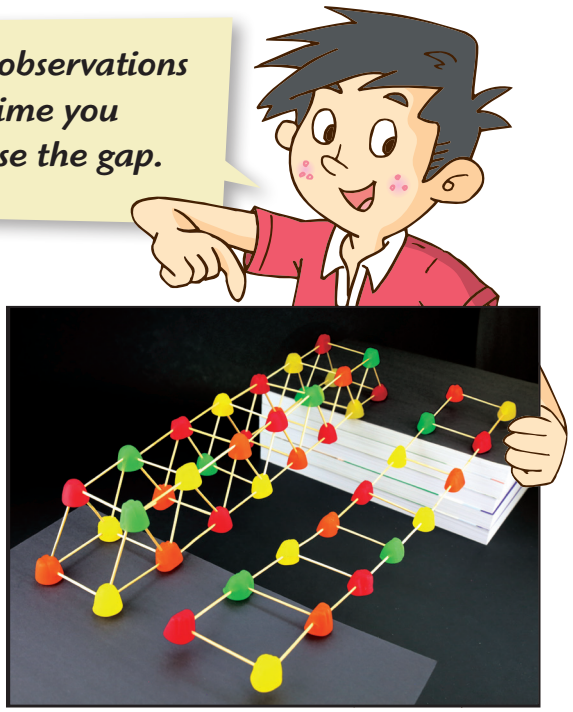

5. Keep increasing the gap by 5 cm each time until you reach 25 cm.
6. Start placing pencils one by one onto the bridges. As you add pencils to each bridge, take note of how many pencils the bridge can support before collapsing.

My Record

Stability / Bridge	At what distance did the bridge start drooping?	How many pencils could the bridge support?
Beam Bridge		
Truss Bridge		

Conclusion:

Circle the correct words after conducting the experiment.

The bridge with the triangular truss was **not as strong as / stronger than** the one without it.

My hypothesis was **correct / incorrect** .

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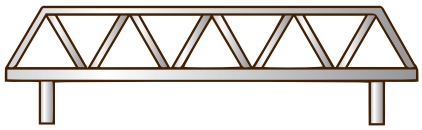
Explanation:

Of the two bridges, you should have noticed that the truss bridge was stronger. Although beam bridges work well for short distances, they are not strong enough to support their own weight and that of additional loads over great distances. Truss bridges, on the other hand, have triangular frames in their design, which increase their strength even though they are made of more material than beam bridges and weigh more. This is why the truss bridge in the experiment did not droop even at greater distances or with added weight.

Beam Bridge

a long and straight beam with a support on each end

Truss Bridge



a bridge that is strengthened by triangular frames