

YEAR 4 UNIT 3: The Big Build

Enquiry Question: How do engineers design strong structures?

Related units: Year 3 Unit 5: How do we begin to answer a scientific question?
Year 5 Unit 6: What impact have different scientists had on us?

Unit overview

National Curriculum Link Year 4: This topic is a chance to develop the children's cultural capital by showing how science is applied in engineering; encouraging them to see the impact of science all around them. The children explore triangles as the strongest shape through enquiries, using their skills of prediction, fair testing and evaluation. They learn about stable structures in the context of bridges and tall towers. It also allows them to explore how engineering appears in nature – in spider webs, birds' nests, bee hives and allows them to learn in more depth about the complex engineering skills of beavers and understand how their engineering solves problems for humans too.

Scientific vocabulary

- structure
- construct
- span
- structural engineer
- arch
- stable / unstable
- fit for purpose
- symmetrical
- pier
- tessellated
- abutment
- deck
- cable
- strengthen
- support
- collapse

Working Scientifically

- Identify, observe and record variables that affect the strength of structures
- Set up practical enquiries and fair tests
- To test how much weight a paper bridge can support
- To evaluate experiments
- To present survey results and consider further questions
- To plan and carry out a fair test
- To identify similarities, differences and changes in results from experiments

Assessment:

1. Explain what makes a strong structure
2. Explain how to carry out a 'fair test'
3. Suggest 2 ways in which an experiment could be improved
4. Explain some reasons why there might be differences in patterns or results in a test

Cross-curricular links

English:

- An explanation text about how to build a beaver lodge and dam.
- Write up a scientific experiment.

Maths opportunities:

- Interrogate results recorded in tables

Teacher knowledge

The earliest type of bridge was a beam bridge when tree trunks were used to cross rivers. Over time, extra support was given by the addition of an arch, with the Romans famous for their brick-built bridges and aqueducts. The strongest bridge is a truss bridge – often seen used for railways to pass across. They are strong due to the ‘truss’ – a structure made from connected shapes (most commonly triangles – the strongest shape). Suspension bridges are also strong and are more suitable when there is a large distance to be spanned.

The strongest shape is the triangle. Triangles are often used to strengthen structures – as seen in bridges, tall buildings and many contexts such as in playground equipment.

Beavers are nature’s finest engineers, damming rivers to create lakes which allow them to gather food safely and reach their lodges via underwater channels to keep them away from predators on land.

Resources

<https://www.youtube.com/watch?v=iyNA62FrKCE>