Practical Investigation: Materials

In this lesson, students will learn about materials, their properties and their uses. They will use this knowledge to design, make and justify a boat to carry mass.

Objectives

- Know properties of different materials.
- Know how the properties of each material relate to its uses on the America's Cup Challenge.
- Explain how materials are chosen in the design process for their particular properties.
- Describe how external environmental factors (e.g salt water) will have an impact on materials used.

Resources

- STEM Crew Materials video
- Worksheet 1: Materials
- Worksheet 2: Uses On Boat
- Worksheet 3: Iterative Design Process
- Assortment of materials for boat. This could include:
    - re-usable ziplock bags for making the packs
    - 200mm dowling rod with 2mm hole drilled in end for wire loop
    - paper or card
    - 6 paper straws
    - cotton or nylon string (fishing wire)
    - masking tape
- Masses to test boats
- Additional/extension worksheets available on STEM Crew website.
- Resources to support the teaching of the Iterative Design Process are available on the STEM crew website

Starter

You could begin the lesson by showing students the Materials video online. Ask students to pay attention to the properties of materials – why are different materials used? You could ask them to call out some of the materials mentioned and add them to the board (slide 3).

Suggested activity

Using Worksheet 1, students note down properties of materials (slide 4). If you have any samples available, students could handle samples of materials while discussing (assess risk of sharp corners, carbon fibre splinters, etc.).

Using Worksheet 2, students label where on the boat materials are used (slide 5). They should be prepared to share their answers and reasoning with the class. (Extension: answer questions on second sheet.)

In groups, students build a boat to carry as much mass as possible (slide 6 – see resource list below). Use Worksheet 3 to support the discussion and start the planning process. Ask groups to explain which materials were used and why.

Test boats by adding masses to the area where the mast meets the hull until the boats break (slide 7).

Plenary

Recap the materials and their properties (slide 8). Ask students what went well and how it could have worked better if they had used different materials. Ask students to recall properties and why they're suitable for applications.

Curriculum links

KS3 D&T: Understand and use the properties of materials and the performance of structural elements to achieve functioning solutions.