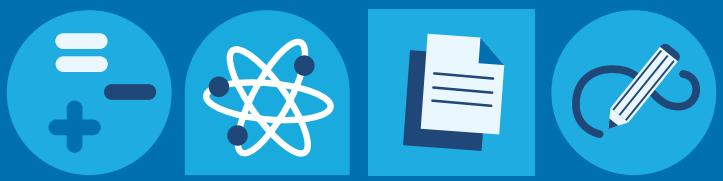
Suitable for 3-7 years

- [x] Solo
- [x] Pairs
- [ ] Groups

Uwe's activity

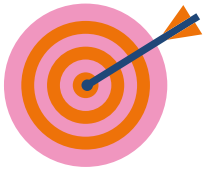
Coral strength testing

How to guide



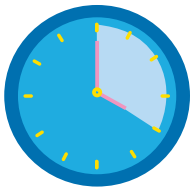
Uwe's activity

Coral strength testing



Aim

The aim of this activity is to find out more about corals and think about the strength of materials. Do you think coral breaks easily?



Timings

15mins

Materials and equipment

- Over in the Ocean In a Coral Reef book
- A couple of different types of paper (e.g. regular drawing paper, newspaper, tissue paper, toilet paper, baking paper, parchment, tissue paper; or you could include tin foil, thin cardboard, plastic bag...)
- Hole punch
- Paints or colouring pencils (if you want to decorate your corals)
- If you want to do additional strength testing with chocolate: Plain chocolate and baking paper

Safety and other considerations:

- Supervise use of cutting materials like scissors and hole punches
- Melted materials will be hot

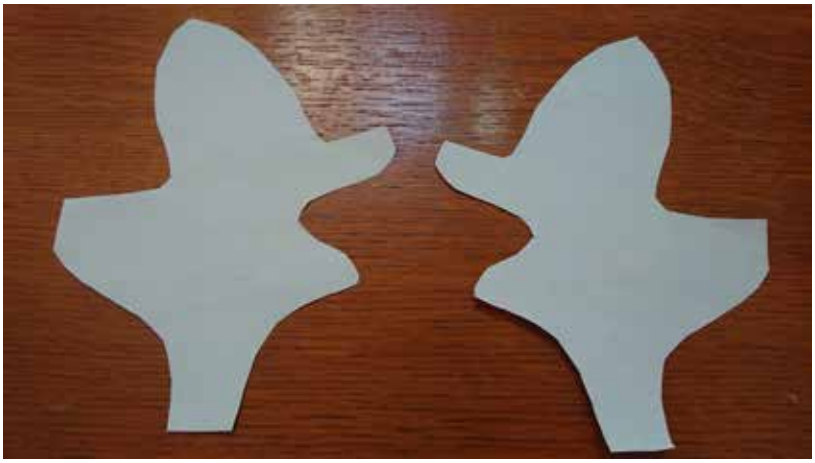
Instructions

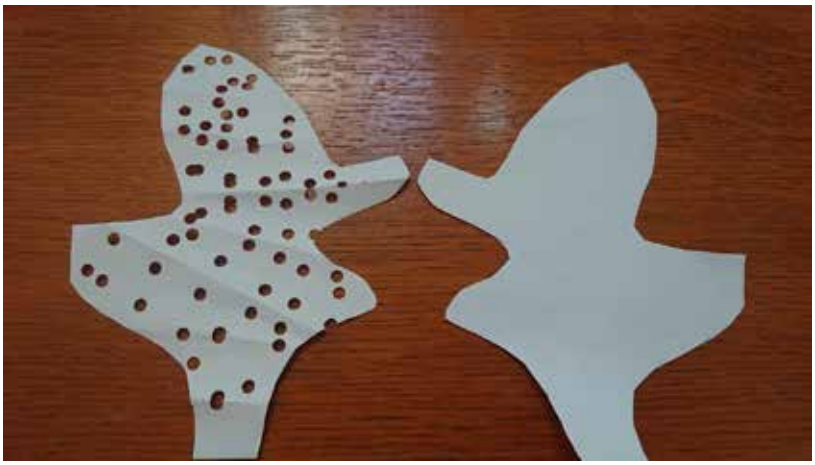
1. Read about corals in the book to introduce the topic
2. Discuss about different types of coral reef comparing tropical reefs with the cold water corals found off the coast of the UK.
3. Explain that climate change is weakening coral structures (more holes in them) making them more likely to break. Engineers are investigating the changes in the coral materials to try to understand, and stop, this destruction of the coral. Engineers use computer models as well as lab tests to see how strong a material is.
4. Ask the children for ideas about how we can test how strong a material is – pull it, squash it, hit it, bend it, drop it etc.

Paper testing

5. Ask what is the best way to test the strength of paper (answer: pulling or tearing; or to put something heavy on it and lift it up/add something heavy to it while people are holding each side; or to hang a heavy weight from one end. Note: to compare different papers tearing will work but the best way to illustrate the difference with the holes is to pull from either side of the paper – children might want to work in pairs to try this; the hanging weight approach will work well for both).
6. Show the children the different types of paper and ask them to predict which break most easily
7. Make your own corals out of the different types of paper, i.e. cut out coral like shapes (of different thicknesses). Make two corals for each paper type and in one of them use a hole punch to cut many holes – you might need to fold the paper to get holes across the structure (ideally the two coral structures would be identical for the most accurate testing so if possible cut out the coral design using two layers of the same paper. You could mention this or you could discuss it afterwards when thinking how to improve the experiment). Alternatively you could test a variety of paper types first then use just one paper type to compare the presence of holes with intact paper.

8. Test the different paper corals – which types of paper are the strongest? Does it make a difference if you include holes? Does it make a difference depending on the design of the coral, i.e. width of the paper? Test the paper by asking the children to pull, tear and rip the paper corals and discuss which break most easily. The answers could be recorded in a table or by ordering small samples of the papers from strongest to weakest. An alternative testing method would be to add weights to one end of the paper, e.g. using a bulldog clip and a hook to add weights to

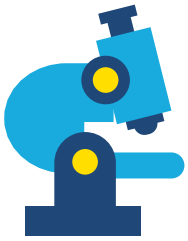




Chocolate testing

Prep – melt the chocolate and pour out two different types of structures – one a solid chocolate the other with a lot of holes, ideally both in coral like shapes. Depending on your set up the children could watch and discuss the melting process.

9. Show the children the different chocolate structures and ask them which will be easiest to break.
10. Test the chocolate shapes to see which breaks most easily.
11. Extend the experimentation by repeating the chocolate shapes and varying the number of holes or the width/ thickness of the chocolate.
12. Link back to the discussion of coral breaking more easily due to climate change.



How it works?

Corals background

Cold water corals promote biodiversity and this depends on their structural complexity. Interweaving branches create small cavities for fish and invertebrates along with spawning sites for fish like deep-water sharks. A healthy coral reef has a mixture of live and dead coral, as the dead coral still provides structure, supporting the rest of the coral framework. With climate change and changing ocean temperature and acidity the coral reefs are under threat. Greater porosity, i.e. more holes, appears in the coral framework leading to crumbling. There are some similarities with how our bones become weaker with age (osteoporosis), although the causes are different. Engineers develop ways to test coral structures (different types of strength tests) grown in the lab to understand exactly how different factors influence the coral strength – when we know this it will help us conserve the corals, e.g. to predict which structures are at most risk or to assess how different actions help preserve the corals

Materials strength testing

Strength is the mechanical behaviour of a material in response to forces acting on it. There are different types of strength, like compressive (pushing/squashing), tensile (pulling), shear (sliding) and impact strength and fracture

toughness (i.e. tough or brittle). Different materials have different strengths. The same material can also change in different conditions, e.g. hotter or colder, if wet or not. Engineers study lots of different materials to find out what makes them strong and to choose the right materials to use in making solutions to engineering problems, e.g. what material for a strong bridge or a strong bag. Our engineer, Uwe, looks at the strength of biological materials to find solutions to stop, e.g. corals and bones, from breaking.

Prompt questions

- How can we test how strong a material is?
- How strong are your corals?
  Do different shapes break more easily?
- Are different papers harder or easier to break?
- Does the holes being in the paper make a difference?
  Does it matter how many holes there are?

Extension ideas

Link this activity with our Under the Sea drama workshop

Try other strength activities with paper, e.g. rolling up a sheet of paper and seeing how much weight (e.g. the number of books) can balance on top? What if you make different shapes out of the paper? What happens if you fold the paper?

You could also make and decorate salt dough corals and track how does the strength of salt dough mixture change over time.

To make salt dough

- 250g plain flour,
- 25g of salt and
- 25mL of water per ~3/4 children);

Instructions

- Mix the flour and salt together then add the water and stir until it comes together into a ball; once hardened

(bake in oven for ~3hrs on lowest setting) the salt dough corals can be decorated with paints.

- Our salt dough was not very brittle so it didn't break easily; in fact it was still a little squishy inside so could stretch slightly – this might differ if you use a different salt dough recipe or if they are hardened for longer.

Uwe is also interested in bones and bone strength. Why not try an activity about bones? What happens if a chicken bone is placed in vinegar?