4. A BIT OF A STRETCH

1-1.5 HOURS

Children design an investigation to discover which type of rubber or plastic is best for making protective gloves which need to be stretchy. They will use measuring equipment to record how each material stretches.

TYPE OF ENQUIRY

Comparative test

OBJECTIVES

Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. (UKS2 Working scientifically)

Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood, and plastic. (Y5 Properties and changes of materials)

SCIENCE VOCABULARY

material, property, properties, stretch, stretchy, brittle, measure, force

RESOURCES

(per child or per group of four, unless otherwise stated)

- 2 small (approx. 51 mm) G-clamps[5]
- range of force meters
- metre rule or tape measure
- device with camera function (optional)
- **Activity Sheet 7** (optional)
- selection of materials (20 cm lengths work well),
  must include:
  - nitrile rubber (e.g. disposable nitrile glove)

  may also include:
  - HDPE plastic (e.g. disposable HDPE glove, single use carrier bag)
  - LDPE plastic (e.g. 'bag-for-life' carrier bag, sandwich bags, bin liners. cling film)
  - vinyl plastic (e.g. disposable vinyl glove)
  - latex rubber (e.g. balloon[6], marigold gloves)

Note that children may ask for additional equipment depending on their independent planning ideas.

5 4 pack of 51mm mini G-clamps £7.99 from Amazon. Price correct at time of publication.
6 Balloons made of other materials, e.g. metal-look plastic, can also be incorporated.

SAFETY GUIDANCE

Some materials will snap easily when stretched. This results in very little recoil and are therefore unlikely to pose an injury risk. Whilst snapping will probably occur, children should be discouraged from intentionally trying to snap the materials.

Remind children regularly to keep their faces away from the materials as their focus will be on taking force or length measurements.

Check to see whether any children have latex allergies before making latex available for testing.

PRIOR KNOWLEDGE/EXPERIENCE

Children will have some experience of setting up simple practical enquiries and comparative tests.

In key stage 1, children will have learned about everyday materials, differentiating between an object and the material it is made from. Children will be able to name a variety of everyday materials, including plastics, describing their physical properties.

Children should also be able to identify the suitability of everyday materials for their specific uses and have an awareness that the shapes of solid items can be changed by squashing, bending, twisting, and stretching.

ACTIVITY NOTES

Revisit the letter from the scientist working for Synthomer (**Activity Sheet 4**). Explain that they make ingredients which other companies use to make their products. One customer wants to use the Synthomer ingredient to make protective gloves, like those worn by healthcare workers. They would like children to test different materials to see which are the most suitable to use for gloves.

Ask children if they can think of other properties that Synthomer's customers would like their gloves to have. In addition to stretchy, they may think of durability, and gloves that will not snap easily.

Provide samples of the materials for children to discuss and share any experiences or knowledge they have relating to their properties and uses of the materials. The materials should be pre-cut so children do not see the objects they have been taken from.

Children now plan their investigations. They can be left to do so independently, or offered suggestions to aid their planning, such as:

- pulling a material to observe how far it will stretch
- measuring the stretch with a ruler and comparing the stretched and original length
- using a force meter to measure the force required to stretch each material.

Here is an example of how each material can be tested:

Children use a small G-clamp to hold material samples firmly on a classroom table.

A second small G-clamp grips the other end of the material, so that it can be stretched easily.

A force meter is attached to the free-moving G-clamp to take a force measurement.

A results table will be needed to collate the measurements taken during the investigation. Children can design their own or use the table provided on **Activity Sheet 7** can be used.

G-clamp attached to table

2. G-clamp attached to material

3. Force meter attached to G-clamp

4. Measuring stretched material with ruler

When data collection is complete, ask children to evaluate their investigation method. Did it go to plan? What did they do well? What could they do better? They should also review their results and form an appropriate conclusion. Which material will they recommend to Synthomer's customer to make their protective gloves?

Once the investigation is over, children can be shown the objects the materials were taken from. This will help children to understand that the materials have real-world uses and help to reduce misconceptions which commonly occur around objects, materials, and properties.

TOP TIP

It can be tricky to read the force meter or get a distance measurement with materials that snap so have spares of the testing materials to enable children to repeat their test.

A device with a camera function is useful when trying to measure stretchiness. Children can record a video as they stretch the material samples, then re-watch and pause to observe from a still image. This will improve accuracy in taking measurements.

QUESTIONS FOR THINKING

- Why does the material for safety gloves need to be stretchy?
- Can you name any other materials that are stretchy?
- Which other items need to be stretchy to do their jobs properly?
- Which objects would not do their job properly if they were made from stretchy material?

USING THE PRESENTATION

After the children have carried out their investigation, use the slides to share examples of products made by companies like Synthomer, and how products are tested. Slide three shows an elongation test in progress, which is similar to the activity carried out by the children. Slide four shows how products are tested for thickness.

To conclude the lesson, use the STEM Careers slide at the end of the presentation to highlight real-world jobs in STEM to nurture children's science capital. Share Orlagh's career profile to inspire pupils by helping them make connections between their classroom learning and the science that is used in exciting jobs.

INDUSTRY LINKS AND AMBASSADORS

Scientists and engineers in industry, such as those working at Synthomer, work hard to make their products more sustainable. They make ingredients for other companies to produce gloves which use less material and remain durable.

An industry ambassador could initiate this classroom activity by introducing this challenge to children and showing them a range of plastic and rubber samples that are stretchy or brittle. They might show a video of elongation tests carried out in a lab or factory setting. The ambassador could outline their job and explain the skills required to carry out their role, explaining that scientists and engineers in industry often need to test products to ensure they are of the best quality to sell to their customers. Finally, the ambassador could discuss the children's results and ask for their recommendations.

STEM CAREERS

Orlagh works in sustainability for Synthomer. She checks how the company treats the Earth, how it treats people and if it follows good rules. Orlagh uses her computer to make charts and look at big reports to track how the company is doing and compares it to other big companies.