



#### Topic: Investigating everyday materials

#### Investigating strength

##### Lesson concepts

- A Everyday materials can be physically changed in a variety of ways
- Science involves asking questions and describing changes
- People use science in their daily lives
- A Questioning can be responded to, posed, and predictions made
- A Investigations can explore and answer questions
- Observations can be collected and recorded
- Observations can be compared with predictions
- Observations can be compared with others
- A Observations and ideas can be represented and communicated

Today students will:

- understand that some materials can be physically changed to make them stronger.

#### Resources

##### Digital

Slideshow — Physical changes: made to increase strength

##### Activity book

Sheet 6 — Investigation: Strength test

Sheet 7 — Paper challenge: How strong is a piece of paper?

##### Find and prepare

Samples of everyday materials to test for strength: aluminium foil, a drinking straw, crepe paper, wool, wood, a plastic bag, a sheet of paper, some waterproof modelling clay

Sheets of A4 paper

A heavy book

Adhesive tape

#### Key terms

For definitions and explanations of terms, please see the [Glossary](#).

## Learning alerts

Be aware of students thinking that 'hard', 'strong' and 'rigid' mean the same thing.

## Suggested next steps for learning

Explain to students that these words do not always mean the same thing, for example: thin ice (hard and rigid but not strong), thin rubber (strong but not hard or rigid).

## Lesson

### Investigate materials for strength

1. Share ideas about everyday objects or structures which must be made from very strong materials for example: bridges, buildings, rescue or climbing ropes.

#### Say to students

“ In this lesson you will be investigating how you can make physical changes to materials to make them stronger.

But first let's find out how strong some materials are. ”

- a. Display samples of materials to test for strength.

#### Say to students

“ We are going to test these materials by pulling them. You will pull from one end and I will pull from the other end. We are going to find out which materials are strong enough to be pulled without breaking. ”

- b. Display **Sheet 6** — [Investigation: Strength test](#).

Support students to read the sheet, completing the section for each material in turn.

- Identify the material.
- Circle 'yes' or 'no' to predict if the material will be strong enough to pull without breaking.
- Test the material by pulling from each end.
- Circle 'yes' or 'no' to indicate if the material was strong enough (that is, it did not pull apart).
- How could the material be changed to make it stronger?

### Focus questions

- Q. *What happened when you pulled the material?*  
 A. For example: It broke. It did not break.
- Q. *What does this tell you about the strength of the material?*  
 A. For example: It is strong. It is not strong.
- Q. *Is this what you thought would happen?*  
 A. Personal response required.
- Q. *What materials do you think a builder might use to build a house? Why?*  
 A. A builder might use wood or bricks because it is strong and the house will stay up.

### Consider how shape affects strength

#### Say to students

‘ Now we are going to investigate one of the materials that broke when we pulled it, to see if we can make it stronger. ’

2. Tell students to choose one of the materials that broke.

### Focus questions

- Q. *Was this material strong?*  
 A. For example: No.
- Q. *Why/why not?*  
 A. For example: It broke when I pulled it.
- Q. *How could you physically change it to make it stronger so that it won't break when you pull it?*  
 A. For example: If I make it thicker it might not break when I pull it.

- a. Give students the sample of the material they chose to make stronger.

#### Say to students

‘ Show me how you can physically change this material to make it stronger. ’

- b. Provide time for students to make changes to the material to make it stronger.  
 c. Test the material to find out if it is stronger.

- d. Provide additional samples of the material if students wish to try other ways of making it strong.
- e. Ask students to share what they did to physically change the material for strength.

### Focus questions

- Q. *How did you physically change the material?*  
A. For example: I folded it.
- Q. *What happened when we tested the material before?*  
A. For example: It broke.
- Q. *What happened when we tested the material this time?*  
A. For example: It didn't break.

### Say to students

‘ Scientists investigate ways of making materials stronger by making physical changes. ’

- 3. Show students a large book.

### Say to students

‘ You have made this sample of material stronger by, for example: folding it.  
Now I want to see if you could fold a piece of paper to make it strong enough to hold this large book. ’

- a. Display **Sheet 7** — [Paper challenge: How strong is a piece of paper?](#)
- b. Point to each of the diagrams.

### Ask students

- Q. *If you change the paper into this shape do you think it will hold the heavy book?*  
A. For example: No.
- Q. *Why/why not?*  
A. For example: Paper is not very strong.

- c. Give students four sheets of A4 paper and some tape to secure the shapes.
- d. Explain to students how to conduct the investigation and support students to complete **Sheet 7**.
  - Fold the paper as shown in each picture.
  - Circle 'yes' or 'no' to predict whether the paper with its shape changed will hold the book.
  - Test whether the paper shape will hold the book.
  - Circle 'yes' or 'no' to record the results.
- e. Discuss what happened in the investigation and ask students to compare the results with what they predicted.

### Focus questions

Q. *What happened when you tested the paper shaped like a tent?*

A. For example: It didn't hold the book.

Q. *Is that what you thought would happen?*

A. Personal response required.

Q. *What happened when you tested the paper shaped like a triangular prism?*

A. For example: It didn't hold the book.

Q. *Is that what you thought would happen?*

A. Personal response required.

Q. *What happened when you tested the paper shaped like a box?*

A. For example: It didn't hold the book.

Q. *Is that what you thought would happen?*

A. Personal response required.

Q. *What happened when you tested the paper shaped like a cylinder?*

A. For example: It held the book.

Q. *Is that what you thought would happen?*

A. Personal response required.

## Investigate real world applications

### Say to students

Scientists conduct investigations to find out ways of making physical changes to materials to increase their strength, just as you did.

Many objects used by people all over the world are made of materials that have been strengthened so that they can be used for a particular purpose.

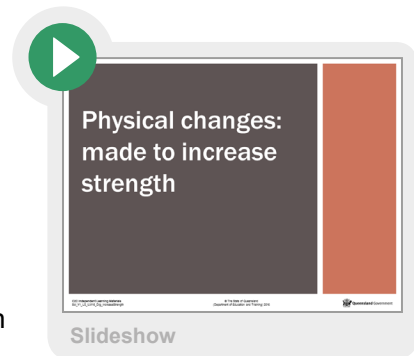
Now we are going to watch a slideshow which shows how some materials have been strengthened for a particular purpose.

#### 4. View the **Slideshow — Physical changes: made to increase strength.**

a. As each slide is viewed:

- Read the text to students and discuss how the material has been strengthened and why, as shown on each slide.
- Ask students to identify familiar items that have been physically changed in a similar way (for example, skipping rope).

b. Ask students to record new understandings about physical changes to make materials stronger.



### Say to students

You have seen how materials can be physically changed to make them stronger.

In the next lesson you will be investigating how physical changes can be made to materials so they can hold/contain things.