

Pre-lesson preparation, materials and equipment

This lesson focuses on the biodegradable properties of wool.

This activity will involve comparing the change in biodegradation over time between wool and synthetic fabric.

Note to teacher: The practical activity in Lesson 6 *Wool – where does it go?* will need to be set up six weeks prior to the lesson being run. [See **Body of lesson** Steps 1-6] This will ensure students can observe distinct differences in the fabrics being tested. They will be able to draw valid conclusions about the performance of wool versus synthetic fabric when exposed to environmental degradation using warm, moist soil as the substrate.

Demonstrate the set-up of this activity before allowing students to investigate for themselves. Before carrying out the demonstration clearly explain to students they must listen carefully to all instructions and ensure they maintain temperature and moisture-controlled conditions in their jars, as far as practicable.

The LEARN ABOUT WOOL factsheets [Properties of wool](#), [Different types of wool fabrics](#) and [Wool is 100% biodegradable](#) combined with the suggested resources listed below provide ample background information to carry out this lesson and answer a range of questions posed by students.

Useful resources:

LEARN ABOUT WOOL factsheets

- [Properties of wool](#)
- [Different types of wool fabrics](#)
- [Wool is 100% biodegradable](#)

Videos

- [Sam the Lamb — Properties of wool](#)

Useful links

- [War on waste digibook](#)
- [ABC Education](#)
- [Woolmark Company website](#)
- [Wool fibre facts and benefits](#)
- [Wool is 100% biodegradable](#)
- [Measuring wool's environmental footprint](#)

Materials and equipment

Per pair of students:

- two glass jars (same size)
- 10 x 10cm piece of 100% wool fabric
- 10 x 10cm piece of synthetic fabric
- plastic mesh onion bag or orange bag
- scissors
- two sticky labels
- hand lens /magnifying glass
- tweezers
- soil (high organic matter content)
- one sheet of A4 white paper
- marker pens
- science journal to record student observations

Lesson objective:

- To allow students to investigate and compare the biodegradability capacity of wool fabric compared with synthetic fabric and draw conclusions about the suitability of these textiles for a range of everyday uses and the environmental impacts of these textiles at the end of their useful life.

Students will have the opportunity to:

- test the biodegradability capacities of wool fabric compared with synthetic fabric
- consider the implications of wool's ability to influence sustainable fashion choices of the user in a range of everyday settings.

Setting the context

The world's landfill facilities are overflowing and a major contributor to this problem is the disposal of unwanted clothing, including wool garments. Wool is composed of protein so microbes within the soil can digest the fibre and return nutrients to the soil. Synthetic fibres, on the other hand, can be extremely slow to break down and significantly contribute to the world's overflowing landfills. In landfills wool degrades rapidly with no long-term damage to the environment.

If wool is kept warm and moist or buried in soil, bacteria and fungal growths develop, which produce enzymes that digest wool.

On the other hand, thanks to the unique chemical structure of keratin and wool's tough, water-repellent outer layer, clean and dry wool fibres do not readily degrade in normal use and storage. This allows wool products to be resilient and long-lasting in normal conditions.

Wool can be composted with other organic material to create a type of fertiliser, rich in nutrients, which can be used to improve pasture for animals.

Lesson focus

The focus of this lesson is to encourage students to think about the link between the biodegradable properties of a fibre and the implications for its end use.

Introduction

Let students know you are going to investigate properties of wool and other textiles that have an impact on the environment. Ask students to suggest ways that textiles, like those they have been investigating in previous lessons might affect the environment.

Encourage students to think about the clothing in their wardrobe. Ask them the following questions:

- What are most of your clothes made of?
- What happens to your old clothes when you grow out of them?
- If they are thrown out, where do they go?
- What do you think happens to them then?

Allow students to explore Chapter 2 of the *War on waste* digibook. Have a short class discussion about the impacts of fast fashion.

Explain that when wool is disposed of, it will naturally break down (biodegrade) in soil in a matter of months to years, releasing valuable nutrients back into the earth. This is because wool is made of protein (keratin, also hair and fingernails) and is a naturally occurring substance. Alternatively, synthetic fibres are very slow to break down and contribute significantly to landfill, many of which are overflowing in Australia.

Explain that soil contains microorganisms, which speed up the breakdown of naturally occurring substances when environmental conditions are suitable. When soil is damp and warm, the rate of breakdown by microorganisms will be optimised.

Let students know that you will be investigating this theory by burying two fabric samples: one wool fabric and one synthetic fabric.

Body of lesson

1. Arrange students into pairs.
2. Provide each pair with two glass jars, two 10 x 10cm samples of fabric (one synthetic e.g. Lycra and one 100% wool fabric), two sticky labels, one marker pen, sufficient plastic mesh to encase each fabric sample.
3. Students can draw or photograph their fabric samples before burial and record their 'before' image in their science journal under the activity heading *Wool — where does it go?*
4. Ask students to half fill each jar with soil (high organic matter, not sand) and place a piece of mesh, followed by the fabric sample and a covering layer of mesh before filling the jar with the remaining soil. Sandwiching each fabric sample between two pieces of plastic onion or orange bag mesh will allow ease of removal from the jar at the end of the activity.
5. Each pair will need to clearly label their jars with their names and the type of sample contained within the jar (i.e. 'wool' and 'synthetic').
6. Place the uncovered jars in a warm position for six weeks.
7. Ask students to record their prediction of what they expect to observe in six weeks' time in their science journal.
8. Leave the samples undisturbed for six weeks.
NOTE: Water may need to be added to the jars to keep the soil moist, but not saturated. To ensure a fair test, ensure the two jars are kept under identical conditions (including the amount of water added to each jar).
9. After six weeks, ask students to carefully remove the samples from their jars using tweezers and place them side by side on an A4 piece of white paper.
10. Ask students to observe the fabric samples using hand lenses or magnifying glasses.
11. Students draw or photograph the samples and compare the 'before' and 'after' images.
12. Students record their observations in their science journal and review their observations against their prediction at the outset of the investigation.

Conclusion

Ask each pair of students to share their results with another pair.

Support the students' discussion with the following questions:

- Was your prediction correct?
- How did we keep the test between the two samples fair?
- Which fabric showed the most breakdown?
- Why do you think this happened?
- If your old clothes are buried in landfill, what do you think will happen to them:
 - in a week
 - in six weeks
 - in a year?
- Which type of clothing would spend the longest time in landfill?
- Which type of clothing will break down the fastest in landfill?

Extension activity

Students can research other methods of reducing the amount of landfill by recycling used garments, rather than disposing of them. Encourage them to discover how easily wool can be recycled by comparing this process with synthetic fibres using the resources listed at the start of this lesson plan or encourage them to design a fair test to compare other fibres and how quickly they biodegrade when buried in soil.

Links to the Australian Curriculum:

- Natural and processed materials have a range of physical properties that can influence their use. ([ACSSU074](#))
- Science involves making predictions and describing patterns and relationships ([ACSHE061](#))
- Represent and communicate observations, ideas and findings using formal and informal representations ([ACIS071](#))
- Compare results with predictions, suggesting possible reasons for findings ([ACIS0216](#))
- Reflect on investigations, including whether a test was fair or not ([ACIS069](#))
- With guidance, plan and conduct scientific investigations to find answers to questions, considering the safe use of appropriate ([ACIS065](#))
- Consider the elements of fair tests and use formal measurements and digital technologies as appropriate, to make and record observations accurately ([ACIS066](#))
- Science knowledge helps people to understand the effect of their actions ([ACSHE062](#))