

WOOL THE WONDER FABRIC SCIENCE INVESTIGATIONS



Clothes that are made from synthetic materials such as polyester require fossil fuels to produce whereas wool is grown naturally on a sheep's back in the same way that hair grows on our heads and the so the only things that we need to produce it are grass and water! Did you know that shearing a sheep is just like us having a haircut and it doesn't hurt the sheep? It's actually a very important process that is needed to keep sheep healthy. We will learn more about this in our live lesson but there's even more to explore! Try these investigations to delve deeper into the properties of wool the wonder fabric!

LEARNING OBJECTIVES:

- To explore and describe the properties of materials and justify their uses
- To identify questions that can be investigated scientifically and suggest suitable methods of inquiry
- To recognise and control variables.
- To recognise patterns from my observations and investigations and can communicate my findings
- To suggest conclusions as a result of carrying out my inquiries
- To evaluate methods to suggest improvements



INVESTIGATION 1: IS WOOL A PLANET-FRIENDLY WONDER FABRIC?

According to HM King Charles, wool is a wonder fabric that is "**versatile, sustainable, renewable and natural**" but we're challenging you to test this claim out for yourselves!

In 2016, HM King Charles buried two jumpers in some soil: one made from wool and one made from a synthetic (or man-made) fibre. He left them there for six months and compared what happened to them.

Your challenge is to carry out a similar investigation to explore the biodegradable properties of wool compared with a synthetic fibre. You could also extend His Majesty's investigation by exploring how the surrounding material affects the biodegradable properties of the two fibres.

PLANNING YOUR INVESTIGATION:

A **variable** is anything that can affect the results we are observing or measuring.

A **fair test** is a controlled investigation that compares two things. In order for a test to be fair, or well controlled, we have to make sure that only one thing (or variable) is changed and everything else that might affect our results is kept the same.

In your investigation, we will be comparing how much two fibres **biodegrade** in compost over a period of 4 weeks. We will be changing whether the fibre is natural or synthetic, so the type of fibre is our **independent variable**. The variable that we are measuring (or **dependant variable**) is the amount of biodegradation that takes place in 4 weeks. You will be measuring this by weighing the fibres both before and after they have been buried and comparing the **mass** that has been lost (the amount of biodegradation that has taken place).

EQUIPMENT:

- Compost
- 2 yoghurt pots or jam jars
- Trowel
- Weighing scales
- Small bundle of natural wool
- Small bundle of synthetic fibre



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Plan your investigation using a table like this one:



| | |
|---|--|
| My research question | |
| Things I will keep the same (or control) | |
| One thing that I will change (the independent variable) | |
| What I will measure (the dependant variable) | |
| My prediction | |

WHAT TO DO:

1. Measure 2 metres of wool and tie it into a bundle. Measure 2 metres of a synthetic fibre and tie it into a bundle.
2. Weigh both of your fabrics and record your measurements in a table.
3. Clearly label your two jars.
4. Add a small amount of compost to the bottom of each of your jars, add the one bundle to each and cover them over with more compost.
5. Wait for 4 weeks and then unearth your bundles.
6. Weigh them both again and work out how much mass has been lost or biodegraded in the soil.

You might like to conduct a second investigation to compare how quickly natural and synthetic fibres biodegrade in different surrounding materials. You might like to repeat the method used in our investigation and change the surrounding material that the natural and synthetic fibres are left to biodegrade in. You could try leaving them in fresh water and salt water and comparing the results with your soil results.

YOUR RESULTS:



What do you notice about the amount that the natural and synthetic fibres have biodegraded? What does this tell you about the properties of each of the fibres?

How well-controlled was your investigation? How might this have affected your results? Is there any way you could improve it next time?

Conduct some internet research to find out how long it would take a full jumper made from each of these fibres to biodegrade.

Can you think of some other uses for the two fibres you have investigated? How might their biodegradable properties be useful?



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INVESTIGATION 2: IS WOOL A WARMING WONDER FABRIC?

How do the insulation properties of wool compare with synthetic (man-made) fabrics? Complete this investigation to after the live lesson to find out!

PLANNING YOUR INVESTIGATION:

In this investigation, we will be comparing how much heat is lost from a beaker/mug of hot water when wrapped in natural and synthetic materials. We will be changing whether the fibre is natural or synthetic, so the type of fibre is our independent variable. The variable that we are measuring (or dependant variable) is the amount that the temperature changes.

Plan your investigation using the planning template we used in investigation 1.

WHAT TO DO:

- Use your learning from the live lesson to think about a sheep's habitat and the properties that their woolly fleece needs to have to help them survive there. Make a prediction: do you think the wool or the man-made material will be a better insulator?
- Wrap 2-4 beakers in different materials (e.g. knitted or felted wool and nylon, acrylic or polyester).
- Taking care, measure the same amount of hot water into each beaker and leave them in the same place.
- Measure the starting temperature of each using a thermometer and place a lid on each.
- After a set time interval (such as every five minutes) measure the temperature of the water in each beaker with a thermometer or data logger.
- Record and discuss your findings. How well-controlled was your investigation? How might this have affected your results? Is there any way you could improve it next time?

Safety: The water temperature must not exceed 50 °C. Ensure an adult is present when working with hot water.

INVESTIGATION 3: IS WOOL A WATER-PROOF WONDER FABRIC?

How do the water-proof properties of wool compare with synthetic (man-made) fabrics? Complete this investigation after the live lesson to find out!

PLANNING YOUR INVESTIGATION:

Use your learning from the live lesson to think about a sheep's habitat and the properties that their woolly fleece needs to have to help them survive there. Make a prediction: **do you think the wool or the man-made material will be more waterproof?**

Plan your investigation using the investigation planning template above. Think about which variables you need to control, change or measure and how you might do this.

EQUIPMENT:



Equipment:

- 25ml measuring cylinders
- Filter funnels
- 10 cm circles of four different fabrics such as wool, cotton, nylon, acrylic



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SUGGESTED METHOD:

- Place a filter funnel in each of four 25 ml measuring cylinders.
- Cut 10 cm circles of four different fabrics such as wool, cotton, nylon, acrylic.
- Fold each fabric circle in half and half again in a similar way to a filter paper and place one in each funnel.
- Add 40 ml of water to each fabric in turn and time and record how long it takes for 20 ml to drip through.
- Feel each fabric and discuss / record your findings.



YOUR RESULTS:

What do you notice about the thermal insulation and waterproof properties of the natural and synthetic fibres?

How well-controlled was your investigation? How might this have affected your results? Is there any way you could improve it next time?

Can you think of some other uses for the fibres you have investigated? How might their properties be useful?

LINKS TO THE CURRICULUM FOR WALES:

SCIENCE AND TECHNOLOGY AREA OF LEARNING AND EXPERIENCE: BEING CURIOUS AND SEARCHING FOR ANSWERS IS ESSENTIAL TO UNDERSTANDING AND PREDICTING PHENOMENA

Progression Step 2:

- I can ask questions and use my experience to suggest simple methods of inquiry.
- I can recognise patterns from my observations and investigations and can communicate my findings.
- I can use my knowledge and understanding to predict effects as part of my scientific exploration.
- I can recognise that what I do, and the things I use, can have an impact on my environment and on living things.

Progression Step 3:

- I can identify questions that can be investigated scientifically and suggest suitable methods of inquiry.
- I can suggest conclusions as a result of carrying out my inquiries.
- I can evaluate methods to suggest improvements.
- I can engage with scientific and technological evidence to inform my own opinions.
- I can understand how my actions and the actions of others impact on the environment and living things.

SCIENCE AND TECHNOLOGY AREA OF LEARNING AND EXPERIENCE: MATTER AND THE WAY IT BEHAVES DEFINES OUR UNIVERSE AND SHAPES OUR LIVES

Progression Step 2:

I can explore and describe the properties of materials and justify their uses.

Progression Step 3:

I can recognise that our planet provides natural materials and can explain why they may have been processed to make them useful.

