Unit Overview

Learning Area: Design and Technology Cross Curricular Priority: Sustainability	Year level: 7	Duration of unit (lessons): 11+

Unit title: Future in Fibre

Identify Curriculum

Prior Learning

Basic computer skills including use of search engines, creating graphs, and using Power Point.
English skills to be able to take research notes, compose a memorandum (300 words), and produce a presentation of 2-minute duration.

Relevant Section of the Achievement Standard

For the food and fibre production context students explain how the features of technologies impact on design decisions, and create designed solutions based on analysis of needs or opportunities. Students create and adapt design ideas, processes and solutions, and justify their decisions against developed design criteria that include sustainability. They communicate design ideas and solutions to audiences using technical terms and graphical representation techniques, including using digital tools.

Content Descriptor/s (from Australian Curriculum)

AC9TDE8K04
Analyse how food and fibre are produced in managed environments and how these can become sustainable.

Learning Objective/s for the Unit

Investigate how and where fibres are used and why the fibre industry is significant in Australia and globally.
Investigate and understand why certain fibres are used in different industries and how they may be recyclable, bio-degradable, or sustainable.
Understand different perspectives and considerations for selection of fibres for industrial applications and justify such a selection.
Explore sustainable alternatives (processes, designs, and technologies) in the fibre industry and their advantages and disadvantages.
Analyse these alternatives compared to current practices and justify how the adoption of these alternatives could have improvement in sustainability and other aspects of a business communicating it to their peers in a digital presentation.

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Develop Assessment Consider 'multiple means of expression'		
Summative Assessment Task Type: Produce a digital presentation of minimum 2 minutes, using Power Point to persuade CEO's and board of directors to adopt a more sustainable process, design, or technology. The presentation can be pre-recorded or delivered as an oral presentation. The presentation must include a minimum of 10 slides and provide multiple supported reasons why the adoption of this process, design, or technology would be beneficial to the sustainability (and other reasons) for the company with one slide exploring the potential drawbacks.		
Formative assessment (Identify the Learning Experiences which will be formatively assessed to ensure that students have practiced and received feedback on the skills expected in the summative assessment)	**Summative Assessment** **Describe the 'how' of the assessment** (What will you as the teacher see, hear or read from the student?)	**Describe the 'what' of the assessment** What knowledge, understanding, and or skill will students need to demonstrate in their response – should align to the Content Descriptors and Learning Objectives?)
• Understanding different types of fibres, their production, industry applications, their recyclability, biodegradability, and sustainability is supported through research and filling out the worksheets that scaffold students' research notes and provide the teacher with a formative assessment of student's research skills and understanding of various fibre industries. • Completing experiments of different fibre properties and producing a graphical representation of the results creates a formative assessment that displays students' understanding of the experimental results, interpreting data and collating it into an easy-to-understand format. Both the completed experiment sheets and the graph become the formative assessment. • Conducting an interview with an 'expert' students show an understanding of reliable sources and resources and analyse the accuracy and biases of information obtained. • Students after discussing the past innovations of the cotton industry, analyse and identify advantages and disadvantages of a single chosen innovation. • Writing a memorandum has students exploring and analysing, from a company's perspective, the reasons and considerations that impact why certain fibres are selected for different applications, such as waste, pollution, cost, energy consumption, transport, etc. They are to convincingly justify their decisions in the memorandum, forming a formative assessment where the teacher can see the level of understanding of considerations a company may make in decisions around operation and production within the fibre industry.	Students will produce a presentation, with digital/visual support in the form of a PowerPoint, that identifies and argues for adopting a more sustainable process, design, or technology for an imagined company in the fibre industry. Students will choose a single fibre industry, investigate current and future sustainability processes that a company may not be using and provide an argument for adopting more sustainable practices, their benefits and potential drawbacks. The presentation must last for a minimum of 2min.	Students will analyse current and emerging sustainable processes, designs, and technologies for their suitability and impact on the fibre industry, form and argument and communicate it as a proposal.

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Teaching and Learning Strategies			
Learning Experiences and Teaching Strategies Informed by a UDL Approach			
5 E Science Inquiry Phase		**Learning Experiences**	**Resources**
Engage	**Lesson 1**	Introduce the topic with a **video** about fibres, their use and their significance to Australia and the global economy. Splitting the class into groups, conduct a quiz using Kahoot to check for understanding of what was contained in the video. This activity can also be done with the teacher asking questions and designated team captains writing the answers on small whiteboards. As a whole class discuss the importance of fibres and their uses in society and culture. Discuss the terms natural, synthetic, blended, and biosynthetic and collaboratively write definitions. As a whole class, brainstorm fibres students already know and fill out Table 1 on the smartboard, categorising the fibres as natural, synthetic, blended, or biosynthetic, and discuss what industries might use them and why. Splitting the class into pairs with one laptop or tablet per pair, students will conduct a treasure hunt to find as many fibres as possible, continuing to fill out Table 1. Extrinsic rewards can be used to engage the students in finding as many as possible. As a whole class, collaboratively fill out a table to include a list of all the students 'found' fibres. Filling out Table 1 will provide a diagnostic assessment for the next part of the unit and identify students who may require additional support or those who will need an extension.	Video Link Here https://www.youtube.com/watch?v=oZP8DCN7dbc Kahoot with suggested questions. Alternatively, teacher derived questions, small whiteboards and markers (enough for 1 per group). Laptop or tablet, one per pair. Table 1 to help organise research notes and formatively assess students research skills. Glossary of terms introduced. Fibre industry glossary https://www.ballyribbon.com/wp-content/uploads/bally_ribbon_mills_glossary_of_textile_terms.pdf
Engage	**Lesson 2**	As a whole class, compile all the fibres students found in their treasure hunt on the smartboard. If extrinsic motivation is used, the winner can be announced now. Ask students if they came across biodegradable, recyclable, or sustainable terms in their treasure hunts. As a class, collaboratively define the terms and discuss their differences and similarities. Discuss some of the students' found fibres and whether they think they are easily recyclable, biodegradable, and sustainable. Introduce Table 2 on the smartboard. The table is the same as Table 1 but with additional columns for recyclability, biodegradability, and sustainability. Similarly to lesson 1, students in pairs will investigate using a laptop or tablet and complete the table for given fibres. Designate a fibre for each pair using a lucky dip with all the fibre names on small pieces of paper in a container and one member of each pair picking it from the container. If students require extension, they can complete additional fibres or join other groups to help them complete the task. As a whole class, collaboratively compile the research information into the table on the smart board. Filling out Table 2 will become a formative assessment for research skills required later in the unit.	Smartboard Table 2 to help organise research notes and formatively assess students research skills. Glossary of terms introduced. Completed collaborative tables can be used as a scaffold for later reference. https://www.fao.org/natural-fibres-2009/about/15-natural-fibres/en/ https://www.herculite.com/blog/the-history-of-synthetic-fabrics https://circuvate.com/blog/what-are-biosynthetic-fibres-and-how-do-they-compare-to-conventional-synthetic-fibres/

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Unit Overview

Explore	**Lesson 3/4**	Discuss why different fibres are used in various industries, and explore what properties are suited for different environments such as marine environments, cold climates, outdoors, indoors, etc. Using cotton as an example, create a collaborative word web on the whiteboard associating different properties and reasons for cotton's use in a variety of industries. Ask students how we find out the properties of fabrics and how well they are suited to a particular use. Pose a problem: Students role-play as a chief engineer of a textiles company. It is their job to determine the best types of fabrics to use for a variety of applications. To do so, they will need to experiment on various fabrics, score them, and compare their properties to find the best fabric for different applications. Discuss properties that could be experimented on in class and those that can't and why. Discuss the safety precautions of these experiments. This activity will be supported by a worksheet that sets out the method of the experiments, safety and PPE, tables for the results, and questions to check for understanding, for example, which fabric had the highest resistance to wear. Split the class into groups of 2-4 to conduct experiments to explore the different properties of fibres. Depending on the level of understanding and time requirements, the experiments for each property can be designated across the groups. Conduct experiments on various fibres such as cotton, lycra (elastane), hemp, wool, silk, polyester, and nylon, investigating properties such as water absorbency, water repellence, fire resistance, elasticity, and wear resistance. Record results and Interpret results by completing questions on the worksheet. At the end of the task, bring the class back together and discuss some of the findings, demonstrating that recording and building graphical data presentations helps to visualise the results. Have the students complete their own graphical presentation of their experiment results.	Experiment worksheets with step-by-step methods, safety protocols, PPE, results tables, and questions to help interpret results.
Explore	**Lesson 5/6**	Pose a problem: Students need to role-play the CEO of the imagined textile. Students may choose an industry/application for a fabric, and as a CEO, they will need to select the most appropriate fabric for that application. Do they just decide to use whatever material the engineer suggests, or are there other considerations? What might they be? Discuss the entire production cycle from obtaining raw materials to the end-user product. Brainstorm as many different considerations that go into choosing the correct fabric for a particular use. Cost of production, energy, transport, where are the raw materials being shipped from, where is it refined, where is it used or sold, pollution, waste, recyclability, biodegradability, is it a limited resource or a sustainable one, etc. Can a CEO know all of this? Who does he rely on? A CEO relies on experts like the chief engineer. Here, we are going to use Chat AI as our expert. We can ask questions and get answers to the best of the AI's understanding of the problem (just like a real expert). Can an expert be wrong sometimes? Do you expect the AI to be wrong sometimes? What are the limitations, and how do we verify the information? As a class, brainstorm questions to ask the AI to help determine potential downsides and alternatives to the engineers' proposed fabrics and verify information received from the AI from credible sources. Complete an interview record with the questions asked of the 'expert' and the response given; this can be copied and pasted from the chat AI into a Word document. Students must verify each answer from the 'expert' with a credible resource and include the website or citation under the answer. Some 'expert' answers may require multiple sources to verify.	Glossary of terms introduced. Typical Results Found after the results table for each experiment. Engineers report.
Explain	**Lesson 7**	Using the information obtained in the interview with an 'expert' and reports from the engineer, students will need to choose a fibre for the selected application/industry. They are to write an intercompany memorandum to the board of directors identifying the chosen fibre along with a justification addressing the cost, availability, recyclability, sustainability, and waste, and it should be around 300 words. Discuss the task, what a memorandum is, and answer any questions students have before they commence the task individually.	Example memorandum

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Elaborate	**Lesson 8**	Discuss sustainable practices, use an example such as the cotton industry and identify changes in process, design, and technology that have emerged in the past to make cotton more sustainable today. Explore and discuss the advantages, potential disadvantages, and considerations that would likely have been made in adopting these changes. As a whole class, choose one aspect of cotton production, i.e. weed control, water usage, GMO, harvesting, and transportation, and brainstorm ideas to improve the sustainability and future of the cotton industry through changes in design, technology, or process. Discuss whether any of these ideas already exist and if they are used in other industries. Are there new and emerging technologies that could be utilised? Discuss how these different innovations can affect different aspects of the production cycle. Students are to choose one innovation discussed in the cotton industry and write one paragraph about its advantages and one paragraph about its disadvantages from a company's perspective.	https://cottonaustralia.com.au/assets/general/Education-resources/CA-resources/CEK_Chap_2_A_Sustainable_Cotton_Industry.pdf https://cottonaustralia.com.au/world-cotton-history#:~:text=1764%2D67%20%2D%20The%20%27spinning,faster%20than%20traditional%20hand%20methods.
	Lesson 9/10	Students will now take on the role of a sustainability expert who is employed to analyse a textile company's production practices to identify where the company can improve their sustainability. Students must research and analyse multiple aspects of the fibre production cycle for more sustainable alternatives. Currently, the company is a significant presence in the industry but is not at the leading edge of sustainable practices. It is the student's job to investigate the production of a fibre and find alternatives in process, design or technology that can support that production to become more sustainable. AI can be used as a tool to discover more about the production of this fibre, but all information will need to be verified from reliable resources. Students are encouraged to draw on their knowledge and skills developed in previous tasks to investigate these alternatives and their advantages and disadvantages. The teacher can use this research time to support students more individually, and students' work can be scaffolded through a table to organise their research notes.	
Evaluate	**Lesson 11+**	Students can now work on their summative assessment. This summative assessment can be completed in class or as a take-home assignment. They are to compile their research and ideas into a cohesive oral and digital presentation to convince a company's board of directors to adopt designs, processes, or technologies that will help the company and their fibre production become more sustainable. Students are encouraged to look at the entire company and the fibre production cycle from raw materials to complete end-user products. The presentation must consist of at least ten slides and be a minimum of 2 minutes in length. All suggestions are to be justified and supported with evidence for the benefits applicable in the fibre production industry and one slide exploring the potential downsides to the suggestions. Final Lesson: Have students take turns delivering their presentations, have the remainder of the class take on the role of the board of directors and allow question time at the end of each presentation. Students are encouraged to ask the presenter questions from a board member's perspective.	Resource Website List

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Unit Overview

Suggested Kahoot Questions and Correct Answers

From what year do the cotton fragments found in Mexico date? 500 BC

At the time of the video how much is the production of natural fibres worth in the U.S? 40 billion

Roughly how many countries produce Wool? 100

What year was the International Year of Natural Fibres? 2009

What fibre was used in the United Republic of Tanzania to produce electricity? Sisal

In the Philippines, what fibre is used to make fibre board? Coconut

According to the video, what is a natural fibre used in the automotive industry? Hemp or Sisal

What is not an advantage of natural fibre composites? The following are advantages, so anything other than: inexpensive, bio-degradable, low weight, good acoustic insulation.

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Unit Overview

Glossary of Terms Introduced

Abrasion resistance: The ability of a material or fabric to withstand wear, rubbing, or scraping without showing signs of damage or deterioration.

Advantage: A positive aspect or benefit of a product, material, or concept.

Bio-degradable: Able to break down or decompose naturally in the environment, usually through the action of bacteria or other living organisms.

Bio-synthetic fibre: A man-made fibre derived from natural resources such as plant materials or animal proteins.

Blended fibre: A fabric or textile made by combining two or more different types of fibres, often to enhance certain characteristics or properties.

CEO: Chief Executive Officer, the highest-ranking executive in a company who is responsible for making major corporate decisions and managing overall operations.

Cotton: A soft, natural fibre obtained from the seed pods of the cotton plant, widely used in textile and fabric production.

Disadvantage: A negative aspect or drawback of a product, material, or concept.

Elasticity: The ability of a material or fabric to stretch and return to its original shape or size.

Engineer: A person who designs, builds, or maintains structures, machines, or systems using scientific and mathematical principles.

Fibre: A thin, thread-like substance that can be spun into yarn or made into textiles. Fibber's can be natural, synthetic, or a blend of both.

Fire resistance: The ability of a material to resist catching fire or to inhibit the spread of flames.

Hemp: A natural, durable fibre derived from the Cannabis sativa plant, frequently used to produce textiles, ropes, and other materials.

Lycra: A trademarked brand of spandex, a synthetic fibre known for its exceptional elasticity and stretchiness.

Memorandum: A written message or communication, often used for internal purposes within organizations to relay information or instructions.

Natural fibre: A fibre that occurs naturally in nature, such as cotton, wool, silk, or hemp, and is not artificially created.

Nylon: A strong, lightweight synthetic polymer fibre known for its durability and resistance to wear. commonly used in textiles and fabrics.

Polyester: A synthetic fabric made from a petroleum-based polymer, known for its durability, wrinkle resistance, and quick-drying properties.

Presentation: A visual display or demonstration used to communicate information, typically in a professional or formal setting.

Proposal: A formal written document outlining a plan, project, or idea, often submitted for consideration or approval.

Recyclable: Capable of being processed or converted into reusable materials through recycling methods.

Silk: A luxurious, natural protein fibre produced by certain insects, primarily silkworms. It is highly valued for its softness, shine, and ability to regulate temperature.

Sustainable: A term used to describe practices, products, or concepts that can be maintained or continued over the long term without negatively impacting the environment or depleting resources.

Synthetic fibre: A man-made fibre created through chemical processes, such as nylon or polyester, often designed to mimic the properties of natural fibers.

Water absorbency: The ability of a material or fabric to absorb water quickly.

Water repellence: The ability of a material or fabric to resist the penetration of water or to repel water droplets.

Wool: A natural fibre derived from the fleece of sheep or certain other animals, known for its warmth, insulation, and resilience.

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University of Southern Queensland

Unit Overview

Table 1

Fibre Name	Fibre Type (natural, synthetic, blended, bio-synthetic)	Industries and Reason for Use

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Unit Overview

Table 2

Fibre Name	Fibre Type (natural, synthetic, blended, bio-synthetic)	Industries and Reason for Use	Recyclability	Biodegradability	Sustainability

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Unit Overview

Measuring Sinking Time to Determine Water Absorbency of Different Fabrics

Materials:
1. Six cloth samples made of wool, silk, nylon, cotton, hemp, polyester, and lycra (cut into identical small squares 2cm x 2cm)
2. A stopwatch or timer
3. A large container filled with water
4. Paper towels or a cloth to dry the samples

Safety:
Ensure set up is away from any electrical hazards.
Depending on the size of the water container it may be heavy to move. The main container can be filled and emptied using a smaller container.
Wet surfaces may become slippery, conduct experiment on a suitable surface and clean up any spills.

Procedure:
1. Begin by cutting the cloth samples into identical small squares, approximately 5 cm by 5 cm in size and three samples of each fabric.
2. Label each cloth sample accordingly (e.g., wool, silk, nylon, cotton, hemp, polyester, and lycra).
3. Fill a large container with enough water to fully submerge the cloth samples.
4. Ensure the water temperature remains consistent throughout the experiment.
5. Arrange the cloth samples in a line, ensuring they are on the same horizontal level.
6. One by one, carefully place each cloth sample on top of the water.
7. Start the stopwatch or timer as soon as all the cloth samples are on the water.
8. Observe and record the sinking time for each fabric sample, i.e., the time taken for the sample to sink and become fully wetted.
9. Repeat steps 6-8 at least three times for each fabric to obtain reliable sinking time measurements.
10. After recording the sinking time, gently remove each cloth sample from the water and gently squeeze out any excess water. Be careful not to alter the fabric's shape or structure.
11. Place the samples on a clean and absorbent surface, such as paper towels or a cloth, to dry.
12. Calculate and record the average sinking time for each fabric by adding up the sinking times obtained in step 8 and dividing by the number of trials.
13. Analyze the data to determine the fabric's water absorbency. The shorter the sinking time, the more absorbent the fabric.

Note: It is crucial to maintain consistency throughout the experiment, especially in terms of cloth sample size, and water temperature. Additionally, extra care should be taken while handling cloth samples to avoid any unnecessary weight or moisture absorption that could affect the results.

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Unit Overview

Measuring Sinking Time to Determine Water Absorbency of Different Fabrics

Results:

Fabric	Trial 1 Sinking Time	Trial 2 Sinking Time	Trial 3 Sinking Time	Average Sinking Time (Total time of 3 trials divided by 3)

What Fabric was the most water absorbent?

Was there any fabric that was water repellent?

Name a use for a fabric that has high water absorbency:

Name a use for a fabric that has low water absorbency or even water repellent:

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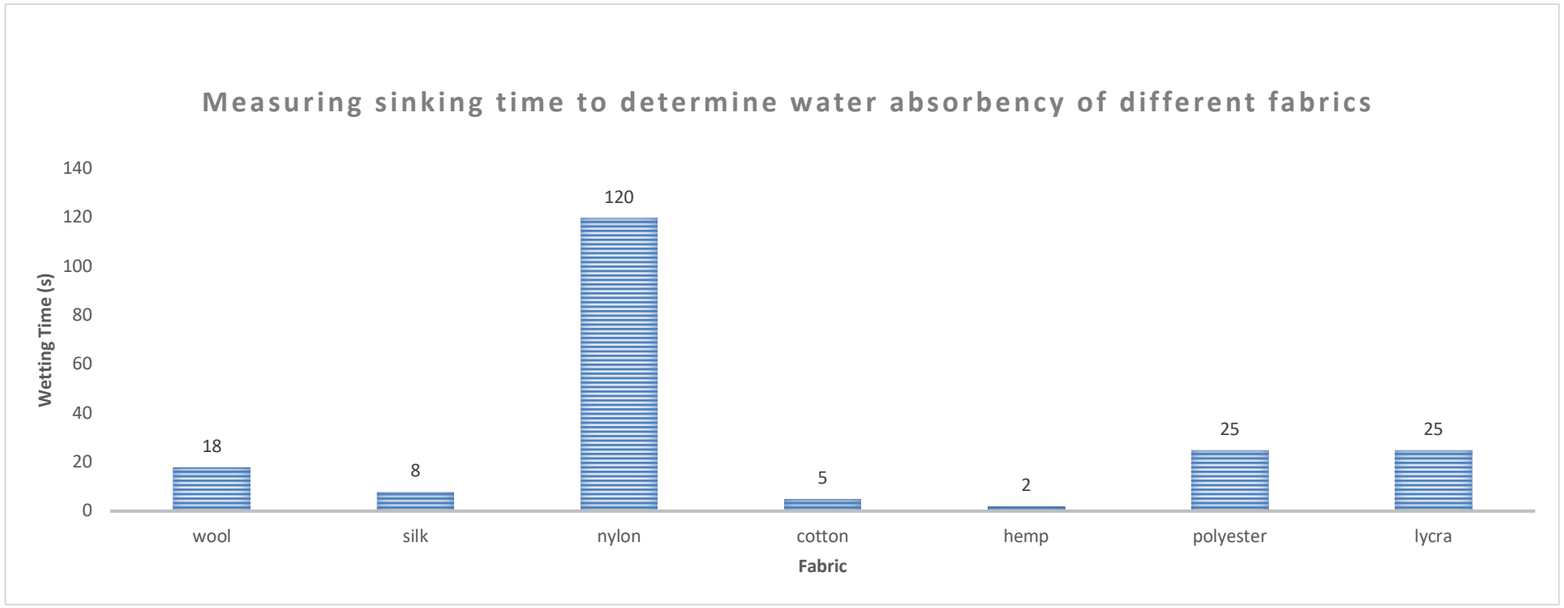
Unit Overview

Measuring Sinking Time to Determine Water Absorbency of Different Fabrics

Typical Results:



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Unit Overview

Comparison of Abrasion Resistance Among Different Fibres

Materials:
1. Fabric Samples ie. Wool, silk, nylon, polyester, lycra, and hemp cut large enough to fit over the end of a 0.5 kg dumbbell.
2. Sandpaper roll (medium-grade 200 grit)
3. 0.5kg weight (Dumbbell)
4. Ruler or measuring tape
5. Scissors
6. Stopwatch or timer
7. Elastic bands
8. Clamps

Safety:
Care when lifting weight, enclosed shoes required.
Keep fingers clear of clamps, clips. Gloves recommended.

Method
1. Begin by preparing the fabric samples of wool, silk, nylon, cotton, hemp, polyester, and lycra. Fit firmly over the end of a dumbbell securing the edges of the fabric sample to the handle of the dumbbell using rubber bands.
2. Set up the testing area on a flat and stable surface.
3. Obtain a piece of medium-grade sandpaper and ensure it is securely fixed to the working surface using the clamps. Grit side up, flat and smooth.
4. Position the fabric sample (attached to dumbbell) on top of the sandpaper and align it at one end of the sandpaper strip. This will be the starting point for abrasion.
5. Start the stopwatch or timer as soon as the fabric is moved.
6. Move the dumbbell in a back-and-forth motion along the sandpaper surface, being careful not to apply any extra force, just allow the weight of the dumbbell to apply the pressure and try and keep the speed of movement the same across all tests.
7. Using the stopwatch, continue the back-and-forth motion for a fixed time, such as 30 seconds, to ensure consistent testing across all fabric samples.
8. After the specified time, remove the weight and carefully examine the wool fabric for any visible abrasion or damage. Record your observations in the table below.
9. Repeat Steps 3-8 for each fabric sample, ensuring a new strip of sandpaper, the same length, is used sandpaper for each trial and is flat and smooth.
10. After completing the abrasion test for all fabric samples, assess the level of abrasion on each fabric based on visual inspection and arrange the samples for most wear resistant (least damage) to least wear resistant (most damage).

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Unit Overview

Comparison of Abrasion Resistance Among Different fibres

Results:

Abrasion resistance rank		Fabric Name	Notes about condition after test
Highest resistance to wear.	**1**		
	2		
	3		
	4		
	5		
	6		
Lowest resistance to wear.	**7**		

Which fibre had the highest resistance to wear?

Name a use for a high wear resistant fibre:

Is there a noticeable feel (softness, smoothness etc.) between high and low wear resistant fibres?

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Unit Overview

Comparison of Abrasion Resistance Among Different Fibres

Typical Results:

The results of this experiment can vary depending on fabric construction as well as other factors.

Abrasion resistance rank		Fabric Name
Highest resistance to wear.	**1**	Nylon
	2	Polyester
	3	Lycra
	4	Hemp
	5	Wool
	6	Cotton
Lowest resistance to wear.	**7**	Silk

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Unit Overview

Comparative Fire Resistance of Various Fabrics

Materials:
1. Fabric samples e.g. wool, silk, cotton, nylon, polyester, hemp, and lycra, all 10cm x 10cm and 3 samples of each
2. Firelighter (a single, identical firelighter to maintain consistency)
3. Stopwatch or timer
4. Metal cooking tray
5. Safety gloves
6. Safety goggles
7. Fire extinguisher (ABE Dry powder)
8. Bucket of water.

Safety:
Fire can be extremely dangerous, ensure not flammable or combustibles are located nearby.
Conduct experiment on a fireproof surface such as bare concreter.
Ensure adequate ventilation such as open windows, conduct experiment in a fume cabinet or outdoors.
Only set light to samples placed in the metal tray.
If outside, ensure its not windy.
Wear fire retardant gloves and preferably clothes, when lighting the samples.

Method:
1. Ensure a well-ventilated space for the experiment. Place the fireproof surface or plate on a stable and fire-resistant table or bare concrete floor.
2. Wear safety gloves and goggles throughout the experiment.
3. Ensure all fabric samples have the same size and shape, 10cm x 10cm.
4. Place one of the fabric samples in the centre of the metal tray.
5. Carefully ignite the firelighter. Hold the ignited firelighter close to one corner of the fabric sample, ensuring that the flame directly contacts the material, leave in place for 3 seconds.
6. Start the stopwatch or timer immediately as the fabric begins to burn.
7. Observe and record, in the table below, the time it takes for the flame to extinguish itself or for the fabric to burn out.
8. Repeat steps 4-7 for each fabric sample (3 samples of each fabric).

Note: It is crucial to prioritize safety throughout the experiment. Use fire safety precautions and conduct the experiment in an appropriate environment to minimize any potential hazards. Keep the bucket of water and fire extinguisher close by.

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Unit Overview

Comparative Fire Resistance of Various Fabrics

Results:

Fabric	Burn Time Trial 1	Burn Time Trial 2	Burn Time Trial 3	Average Burn Time (Divide total burn time of the 3 trials by 3)	Did the Fibre Self-Extinguish Before Burning Through?	Estimated Percentage of Sample Burnt
					Y / N	
					Y / N	
					Y / N	
					Y / N	
					Y / N	
					Y / N	
					Y / N	

Which fibre was most fire resistant?

Name a use for a fibre with high fire resistance:

Name a use for a fibre with a low fibre resistance:

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Unit Overview

Comparative Fire Resistance of Various Fabrics

Typical Results:

Highest to lowest fire resistance:

1. Hemp: Hemp fabric has one of the highest fire resistance ratings among natural fibres. It requires more time and direct exposure to ignite, and it burns very slowly with a low flame spread.

2. Wool: Wool is known to be naturally flame resistant due to its high moisture content and structure. It has a relatively low flammability, and it tends to self-extinguish when removed from the flame source.

3. Silk: Silk is a protein-based fibre, and it has moderate resistance to fire. It is not highly flammable and often self-extinguishes once the flame source is removed.

4. Lycra: Lycra is a synthetic fibre primarily used for its stretchability. It has a low resistance to fire compared to natural fibres. When exposed to flame, it can melt and stick to the skin, causing severe burns.

5. Cotton: Cotton is a commonly used natural fibre, but it is relatively flammable. It ignites easily and burns quickly, making it less fire resistant than some other materials.

6. Polyester: Polyester is a synthetic fabric that can melt under high heat. It has a low resistance to fire and can burn quickly, releasing toxic fumes when ignited.

7. Nylon: Nylon is another synthetic material that is not highly fire resistant. It melts and burns easily, releasing thick black smoke and toxic fumes. It has a lower resistance to fire compared to many natural fibres.

Please note that fire resistance can be influenced by various factors, including fabric blends, thickness, weaves, and any treatments applied to the materials.

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Unit Overview

Comparison of Elasticity in Various Fabrics

Materials:

1. Seven fabric samples: wool, silk, nylon, cotton, hemp, polyester, and lycra (each approximately 2cm x 10cm in size, 3 samples of each)
2. Tape measure or ruler
3. 2kg weight
4. Retort stand or any stable support for hanging fabric samples.
5. weight-hanging mechanism clamp or s clip (that won't damage fabric sample) with string attached to weight
6. Stopwatch or timer
7. Pen and paper for recording observations

Safety:

Care when lifting weight, enclosed shoes required.
Keep fingers clear of clamps, clips. Gloves recommended.

Method:

1. Label each fabric sample clearly with the corresponding material.
2. Measure the initial length of each sample accurately a record it against the sample name and number.
3. Set up a retort stand or any other stable support at a suitable height.
4. Attach weight-hanging mechanism (such as an S-clip) to the retort stand. Ensure that it can be easily hooked onto the fabric sample without damaging it.
5. Place fabric sample to be tested in the rig by hanging it vertically from the narrow edge.
6. gradually apply the weight to the bottom narrow edge of the sample
7. Allow a set time, 10 seconds, for the fabric to stretch and stabilise under the applied weight.
8. Measure the length of the fabric whilst the weight is still applied and record the results in the table below.
9. Carefully remove the weight and remove the sample from the jig.
10. Allow 3minutes for the fabric to settle before remeasuring it without weight and record results under final length in the table below.

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Unit Overview

Comparison of Elasticity in Various Fabrics

Results

Fabric Name	Sample Number	Initial Length (mm)	Weighted Length (mm)	Final Length (mm)
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			
	1			
	2			
	3			

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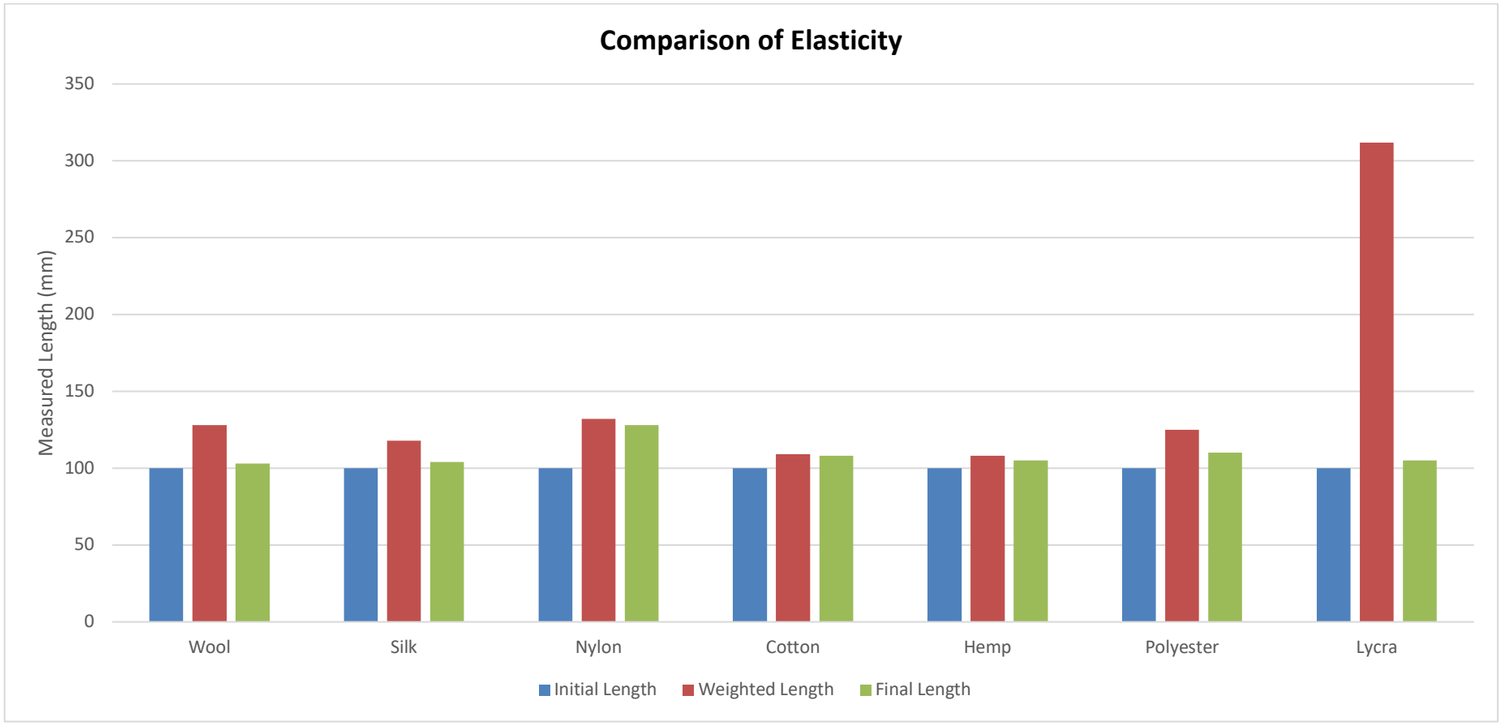
Unit Overview

Comparison of Elasticity in Various Fabrics

Typical Results



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Unit Overview

Engineer's Report

Executive Summary
This engineering report aims to provide a technical analysis of cotton and recommend its use as a suitable fabric for clothing. Cotton has been widely used in the textile industry due to its favourable properties, ease of cultivation, and wide availability. By examining its physical and mechanical characteristics, sustainability aspects, and overall performance, it is evident that cotton stands as a prime candidate for clothing fabrication across various industries.

Table of Contents

1. Introduction
Cotton, a natural fibre derived from the seed pods of cotton plants, has been utilized for thousands of years in apparel production. Its popularity stems from its inherent strengths and versatile range of applications. This report will evaluate cotton's suitability for modern clothing production from a technical standpoint.

2. Physical and Mechanical Characteristics
Cotton fibres possess desirable characteristics for clothing. They are lightweight, soft, and offer excellent moisture absorption, allowing wearers to remain comfortable in various climatic conditions. Moreover, cotton exhibits acceptable elongation and strength properties, which enable it to withstand frequent stresses encountered during garment use.

3. Comfort and Breathability
Cotton's breathability makes it an ideal fabric for clothing. Its structure allows air circulation, facilitating moisture evaporation from the skin, thus avoiding discomfort and fostering a cooling effect. The resulting breathability enhances the wearer's comfort, particularly in warm environments or during physical activities.

4. Durability and Wear Resistance
While cotton is not as inherently durable as certain synthetic fibres, it still offers considerable durability and resistance to wear and tear. Its high tensile strength enables cotton fabrics to withstand frequent use and laundering. Additionally, cotton fibres possess good resistance to abrasion, allowing clothing items to retain their quality and functionality over time.

5. Sustainability and Environmental Factors
Cotton is considered an environmentally friendly choice for clothing manufacturing. As a natural fibre, it is biodegradable and does not contribute significantly to the accumulation of non-biodegradable waste. Furthermore, producing cotton fabrics requires relatively low energy input and generates less pollution compared to synthetic fibre production.

6. Performance in End-use Applications
Cotton's versatility makes it suitable for a wide range of clothing applications. It excels in casual wear, undergarments, and other items where comfort is prioritized. Moreover, cotton's absorbency and moisture-wicking properties make it appropriate for sportswear, sleepwear, and activewear. Its excellent dyeing properties allow vibrant colour choices and printing adaptability, enhancing its visual appeal.

7. Conclusion
Based on the technical analysis conducted, cotton emerges as a strong candidate for clothing fabrication. Its physical and mechanical characteristics, comfort and breathability, durability and wear resistance, sustainability factors, and versatile performance make cotton a reliable and suitable fabric option for clothing production.
This engineering report concludes that cotton, from a technical perspective, is an excellent choice for use in clothing due to its favourable properties and compatibility with various end-use applications.

[Your Name]

[Your Company Name]

[Date]

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Unit Overview

Example Memorandum

[Your Company Name]

[Date]

MEMORANDUM

To: Board of Directors

From: [CEO's Name]

Subject: Announcement of Renewable Energy Goal

Dear Board of Directors,

I hope this memo finds you in good health and high spirits. I am writing to share an exciting update regarding our company's commitment to sustainability and environmental conservation.

Today, I am pleased to announce our ambitious goal of achieving 50% renewable energy use by the year 2025. As the world grapples with the escalating effects of climate change, it is imperative that we, as responsible corporate citizens, take significant steps towards reducing our carbon footprint and promoting a greener future.

Adopting renewable energy sources not only aligns with our values of sustainability and social responsibility but also brings substantial benefits to our organization and stakeholders. This bold initiative will not only support a cleaner environment but also enhance our competitive advantage, foster innovation, and attract socially-conscious customers and investors.

To achieve this goal, our company will undertake a comprehensive renewable energy strategy that encompasses a series of targeted initiatives. These initiatives include:

1. Energy Efficiency Measures: Implementing energy-efficient technologies across our facilities, such as LED lighting, smart thermostats, and optimized HVAC systems, to reduce energy consumption.

2. On-site Renewable Energy Generation: Investing in solar panels, wind turbines, and other renewable energy systems to generate sustainable energy on our premises, further reducing our reliance on fossil fuels.

3. Off-site Renewable Energy Procurement: Forming strategic partnerships with reputable renewable energy providers to purchase power generated from renewable sources, such as wind or solar farms.

4. Educational Campaigns and Employee Engagement: Enhancing awareness and understanding of renewable energy among our employees through dedicated campaigns, training programs, and incentives that encourage sustainable practices both at work and at home.

To successfully execute this transformative initiative, a Renewable Energy Task Force will be formed, comprising a multidisciplinary team of experts from various departments across the organization. This task force will collaborate closely with external consultants, renewable energy specialists, and industry experts to develop a detailed roadmap and oversee the implementation of renewable energy projects.

I wholeheartedly believe that this renewable energy goal will not only help mitigate the adverse effects of climate change but also position our company as a leader in sustainability, a role model for other businesses, and a driving force for positive change in our industry.

Together, we can make a remarkable difference in the battle against climate change while safeguarding our long-term success and environmental legacy.

Thank you for your unwavering support and dedication to our company's vision and values. I am confident that, with your leadership and the collective efforts of our talented team, we will successfully achieve our renewable energy target by 2025.

If you have any questions or suggestions, please feel free to reach out to me or the Renewable Energy Task Force. We will provide regular updates to keep you informed about our progress and milestones achieved along this admirable journey.

Best regards,

[CEO's Name]

CEO, [Your Company Name]

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Unit Overview

Resource Websites

https://www.fao.org/natural-fibres-2009/about/15-natural-fibres/en/

https://www.herculite.com/blog/the-history-of-synthetic-fabrics

https://circuvate.com/blog/what-are-biosynthetic-fibres-and-how-do-they

https://www.sustainyourstyle.org/en/fiber-ecoreview

https://textileexchange.org/

https://www.ecofashionworld.com/

https://www.fashionrevolution.org/

https://goodonyou.eco/

https://www.ethicalclothingaustralia.org.au/

https://sustainablefashion.com.au/

https://remake.world/

https://bettercotton.org/

https://apparelcoalition.org/

https://www.wool.com/

https://www.woolmark.com/industry/sustainability/wool-is-a-sustainable-fibre/

https://ozhemp.com.au

https://www.hempclothingaustralia.com/sustainability#:~:text=Hemp%20is%20one%20of%20the,to%20other%20natural%20fibre%20plants.

https://bhumi.com.au/blogs/unearthed/sustainable-fabrics-list

https://3dlook.ai/content-hub/7-sustainable-fashion-technologies/#:~:text=Some%20eco%2Dfriendly%20textile%20alternatives,long%2Dwearing%2C%20and%20biodegradable.

https://www.researchgate.net/publication/350414774_Sustainable_technologies_for_textile_production

https://www.startus-insights.com/innovators-guide/textile-industry-trends/

https://www.csiro.au/en/education/programs/stem-professionals-in-schools

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Unit Overview

Recommended Further Learning

This unit aims to build skills and understanding around green terms such as sustainability, recyclability, and biodegradability in real world contexts. The unit explores decision-makers perspectives, such as company directors, and the considerations made around the operation and production using sustainable methods, the advantages, and the disadvantages. With a solid foundational understanding of company practices in the selection of raw materials and processes, technologies in production and delivery to consumers, along with supported and guided research practice, students are well positioned to explore new contexts such as food production and the differences in the factors that drive both consumers and companies into sustainable alternatives for a preferred future for us all.

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