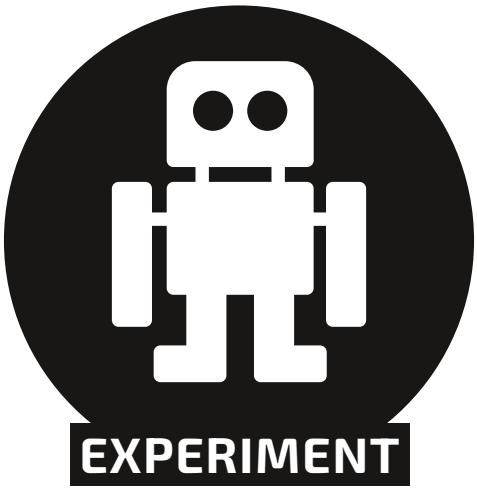
#1

TEXTILE SUPPLY CHAIN

PHASE 0

DESIGN

CREATIVE PROCESS OF CONCEPTUALIZING AND DEVELOPING PATTERNS, MATERIALS, AND PRODUCTS THAT GUIDE THE PRODUCTION AND MANUFACTURING OF FABRICS AND GARMENTS.



AI IN FASHION

Artificial Intelligence (AI) is changing the fashion industry—from how clothes are designed and produced to how they are marketed and sold. Algorithms can predict trends, personalise shopping experiences, optimise supply chains, and even generate new designs. In this experiment, you will explore how AI tools process data, recognise patterns, and support decision-making in fashion.

90 Minutes

+ **Laptops for students with internet connection**
+ **Paper /Flipchart for the presentation of the results**

LEARNING OUTCOMES

Students are able to:

understand how artificial intelligence can be applied in different areas of the fashion industry, such as design, trend forecasting, production, and retail.

critically reflect on the opportunities and limitations of AI in the context of fashion, including ethical, creative, and sustainability aspects.

develop interdisciplinary thinking by linking fashion and aesthetics with technical innovation and problem-solving approaches.

STEPS

1. Introduce the topic and define key terms like machine learning, pattern recognition, data training, and personalisation.
2. Show examples of AI use in fashion: virtual fitting rooms, trend prediction, automated design tools, or style recommendation systems.
3. Divide students into groups, each focusing on a different AI application in fashion:

   Group 1: AI in design
   (e.g. generative design tools, digital sketches)

   Group 2: Trend forecasting
   (e.g. analysing social media data)

   Group 3: Personalised shopping
   (e.g. recommender systems)

   Group 4: Sustainability & production
   (e.g. AI for reducing overproduction)

4. Research and gather data or examples. Each group researches their topic using case studies, videos, or AI platforms (like ChatGPT, Fashwell, or platforms with AI-powered design tools).

   Encourage students to find out:

   - What problem is being solved?
   - What kind of data is used?
   - How does AI make a decision or prediction?

5. Analyse and reflect on the impact
6. Present project results

QUESTIONS FOR REFLEXION

How does AI change the way fashion is designed, produced, or sold?
Can you think of examples where AI improves efficiency or creativity?

What kind of data does AI need to function in the fashion industry,
and where does that data come from?

What are the advantages of using AI in fashion,
and what are some risks or downsides you discovered?

Do you think AI can or should replace human creativity in fashion design?
Why or why not?

How can AI be used to support more sustainable or ethical fashion practices?
What potential do you see for reducing waste or overproduction?

TEACHER'S NOTES

Start by explaining the relevance of AI in the fashion industry:
from design automation to sustainable production.

Highlight interdisciplinary learning: fashion meets computer science,
data literacy, design, and environmental thinking.

Use guiding questions throughout the process to keep inquiry focused and relevant.

There is no single “correct” outcome—what matters is students’
ability to understand and reflect on how AI works in context.

RESOURCES

How AI changing fashion industry
https://www.youtube.com/watch?v=DT3VL_Wddus

How AI affect global fashion
https://www.youtube.com/watch?v=wewsa5h3wH8

AI in Fashion
https://www.voguecollege.com/articles/
how-ai-is-shaping-the-fashion-industry-in-2024

CAREER GUIDANCE:
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Promoting sustainability in the textile and fashion industry through STEM careers.

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Eurocultura, Italy

GoSpark , Slovenia

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#2

TEXTILE SUPPLY CHAIN

PHASE 0

DESIGN

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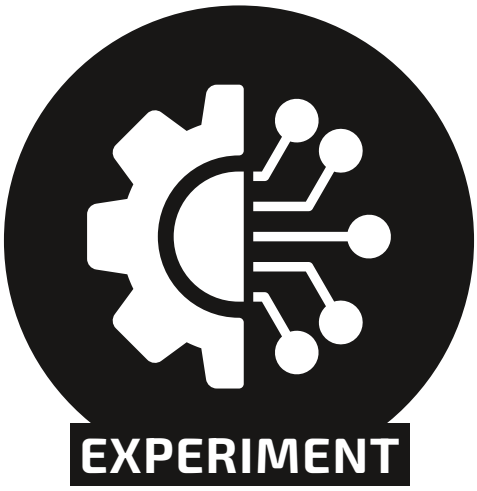

A NEW TECHNOLOGY FOR THE FASHION INDUSTRY

As fashion becomes increasingly integrated with the digital world, designers and brands are turning to science and technology to revolutionise how clothing is produced, marketed, and worn. From 3D knitting to AI-powered design tools and automated production lines, innovation is shaping every stage of the fashion lifecycle. But what if a key technology was still missing?

In this activity, students are challenged to imagine a new, cutting-edge technology that could transform one specific phase of textile production—whether it's fibre creation, dyeing, cutting, or recycling.

60 Minutes

- Desks and chairs
- A projector
- A computer for the teacher
- Slides for presentation (optional)
- A paper or virtual space for writing notes and drawing sketches for students

LEARNING OUTCOMES

Students are able to:

explore the various uses of technologies in fashion industry.

formulate an innovative tech idea.

practice how to present an idea to the public.

STEPS

1. Introduce the activity and the topic, eventually using a video for support.
2. Divide the students in small groups and start the practical session: "Think of a problematic step you encounter in your manual work to create a piece of clothing, and imagine a technology that could solve that issue". Students should produce a written and visual description, and also try to predict its cost.
3. Finally, all groups present their ideas to the others.

QUESTIONS FOR REFLEXION

What is it worth to keep "manual" and not delegated to technologies?

When does technology enhance fashion, and when might it risk making it less meaningful or personal?

How can we find a balance between innovation and preserving human involvement in creative industries?

TEACHER'S NOTES

Start by showing how digitalisation, automation, and smart materials are reshaping the fashion industry.

Use the reflection focus (“What is it worth to keep manual?”) to open conversations on craftsmanship, culture, and human value in fashion.

Encourage students to consider not just what we can automate, but what we should preserve.

RESOURCES

Top 9 technology trends reshaping fashion
https://techpacker.com/blog/design/top-09-fashion-technology-trends

Technology trends in fashion
https://www.youtube.com/watch?v=A_zZq2XABxw

Vogue Business Technology
https://www.voguebusiness.com/technology

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#3

TEXTILE SUPPLY CHAIN

PHASE 1

FIBER PRODUCTION

THE CREATION OR HARVESTING OF RAW MATERIALS, SUCH AS NATURAL FIBERS (COTTON, WOOL, SILK) OR SYNTHETIC FIBERS (POLYESTER, NYLON).

FIBER BURN TEST

IDENTIFYING TEXTILE FIBERS BY BURNING CHARACTERISTICS

Students conduct a small-scale burn test on common textile fibres (cotton, wool, polyester) to observe flame behaviour, smell, residue and after-glow. By comparing the results, students can differentiate natural from synthetic fibres – a core skill in quality control and material selection within the textile sector.

45 Minutes

- **10 MIN** setup and safety briefing
- **20 MIN** burn observations (pairs rotate through stations)
- **10 MIN** clean-up
- **5 MIN** debrief and wrap-up

+ **Long-handled tweezers or pliers**
+ **Heat-resistant tiles or a metal tray lined with aluminium foil**
+ **Candle or micro-Bunsen burner and matches/lighter**
+ **Bowl of water or Class A fire-extinguisher nearby**
+ **Lab tongs for extinguishing**
+ **PPE: cotton lab coats, safety glasses, heat-proof gloves**
+ **Observation sheet or lab notebook, marking pen**

+ **3 × 2 cm squares each of 100 % cotton, 100 % wool, 100 % polyester, plus one unknown sample**

LEARNING OUTCOMES

By the end of the lesson students will be able to:

List key burn characteristics (flame type, odour, ash/residue) for wool, cotton and polyester.

Distinguish natural vs. synthetic fibres based on observed combustion traits.

Apply safe laboratory practice when working with open flames and hot materials.

STEPS

1. Label samples and foil with fiber contest of each sample.
2. Pull up 3 to 5 fibers from each sample and place on labeled foil.
3. Hold first sample with tweezers over foil.
4. Light with match, lighter or candle.
5. Observe flame, ash, residue and burning characteristics (smell).
6. Record your observations.
7. Repeat with other samples.
8. Record your observations.

Sample	Burn or Melt	Shrinks from Flame (y/n)	Odor	Describe ash or residue
Wool fabric				
Cotton fabric				
Polyester fabric				
Unknown sample				

QUESTIONS FOR REFLEXION

How did odour differ between protein, cellulosic and synthetic fibres?

Which sample formed hard beads?
What does this indicate about its polymer structure?

How might fibre flammability influence garment selection
for specific occupations (e.g., chef jackets, children's sleepwear)?

What limitations does the burn test have for blended fabrics or treated textiles?

TEACHER'S NOTES

Supervision – Instructor must ignite first sample and oversee all burns.

Ventilation – Use outdoor space to minimise inhalation
of fumes or make sure you open the window.

Differentiation – Advanced learners can include acetate,
nylon or a blended mystery fabric.

Assessment – Collect completed observation sheets and a short reflection paragraph.

RESOURCES

Colorado State University Extension. (2020).
Textile Experiments (Experiment #1 – Burn Test) [PDF]. Colorado 4-H.
https://co4h.colostate.edu/statefair/score-sheets/Textile-Experiments.pdf

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#4

TEXTILE SUPPLY CHAIN

PHASE 1

FIBER PRODUCTION

THE CREATION OR HARVESTING OF RAW MATERIALS, SUCH AS NATURAL FIBERS (COTTON, WOOL, SILK) OR SYNTHETIC FIBERS (POLYESTER, NYLON).

NATURAL AND SYNTHETIC FIBRES

PROCESS OF FIBRE PRODUCTION

Fibres are required as a raw material to produce yarns and later textile surfaces. Natural, animal and synthetic fibres can be obtained. A distinction is made between conventional and alternative fibre production methods. The alternative production of fibres in an environmentally friendly way. Natural, animal and synthetic fibres have different properties that define the later garment in terms of wearing comfort and care properties.

In the following experiment, the water absorption of natural and synthetic fibres will be compared in order to draw conclusions about wear and properties of a garment.

30 Minutes

+ **Kitchen scales with high resolution (several students can use one scale, clean after use)**
+ **Clean container per raw fibre to prevent contamination and thus weight falsification**
+ **Container for draining the excess water absorbed**
+ **Tweezers for giving and removing the raw fibre (several pupils can use one pair of tweezers, clean after use);**
+ **Paper and pen for notes and evaluation**

Favourable example of raw material:

- **100% cotton filling for e.g. pillows or cuddly toys**
- **100% synthetic filling e.g. 100% PES for e.g. pillows or cuddly toys**

LEARNING OUTCOMES

Students are able to:

differentiate between natural and synthetic fibres.

carry out and analyse weight measurement for a comparison.

to interpret the result and use what they have learned to identify and describe possible wear and care characteristics of a piece of clothing.

STEPS

1. Provide each student or group with a sample of a natural fibre and a synthetic fibre in their raw form.
2. Have the students weigh each dry fibre sample and record the measurements.
3. Instruct the students to fully immerse both fibre samples in water for one minute.
4. After one minute, remove the fibres from the water and gently remove excess surface water without squeezing.
5. Weigh the wet fibre samples and record the new measurements.
6. Ask the students to calculate the weight ratio from dry to wet for each fibre.
7. Guide them to compare the results to determine which fibre absorbed more water.

QUESTIONS FOR REFLEXION

What differences did you observe between the water absorption of natural and synthetic fibres?

Why do you think one type of fibre absorbed more water than the other?

How might the absorbency of a fibre affect the comfort or function of clothing made from it?

Were there any challenges during the experiment that may have influenced your results?

How could this type of testing be useful in the design or selection of clothing for specific purposes (e.g. sportswear, outdoor wear)?

TEACHER'S NOTES

Set up workstations with containers, towels, and scales ready in advance.

Group students in pairs or small teams to support peer collaboration and reduce equipment use.

Ensure that water is handled carefully to avoid spills or slipping.

Remind students not to ingest or misuse materials.

RESOURCES

Learning cards for the differentiation between natural and synthetic fibres:
https://padlet.com/CorEdu/textile-revolution-sustainable-textile-education-for-future--v2p0slbq1hjzhhou/wish/E1P8aX8G0EowawA9

The digital learning platform Textil Trainer provides fundamental knowledge about textiles.
https://textil-trainer.de

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#5

TEXTILE SUPPLY CHAIN

PHASE 1

FIBER PRODUCTION

THE CREATION OR HARVESTING OF RAW MATERIALS, SUCH AS NATURAL FIBERS (COTTON, WOOL, SILK) OR SYNTHETIC FIBERS (POLYESTER, NYLON).

DIY BIODEGRADABLE PLASTIC

CASEIN FROM MILK

Students will explore bio-based materials by creating biodegradable plastic from casein protein found in milk. Using vinegar to curdle the milk, they extract casein, which they then mold into shapes.

By comparing the properties of this natural plastic to conventional synthetic polymers, students learn about sustainable alternatives in textiles and plastics.

60–90 Minutes
plus drying time

15–20 MINUTES Preparation and curdling
15–30 MINUTES Extracting and molding casein
1–2 HOURS (can vary) Drying time
15–20 MINUTES Observation and comparison

- Fresh milk (preferably full-fat)
- White vinegar (acetic acid)

- Saucepan or microwave-safe container
- Stirring spoon
- Strainer or cheesecloth
- Bowls or containers
- Wax paper or silicone mat (for molding)
- Rolling pin or mold (optional)
- Gloves (optional)
- Paper towels
- Scale or measuring cups
- Notebook for observations

LEARNING OUTCOMES

The student is able to:

Explain the concept of bio-based materials and their significance for sustainability.

Demonstrate the chemical process of casein extraction from milk using acid-induced curdling.

Produce a biodegradable plastic sample from natural protein.

Compare and contrast properties of bio-plastics with synthetic plastics.

STEPS

1. Heat about 250 ml of milk until warm (not boiling), either on a stove or microwave.
2. Slowly add about 30 ml of vinegar to the warm milk while stirring gently. The milk will curdle as casein separates from the liquid.
3. Pour the mixture through a strainer or cheesecloth to separate the curds (casein) from the whey (liquid).
4. Rinse the curds with cold water to remove excess vinegar.
5. Press the curds between paper towels to remove excess moisture.
6. Knead and mold the casein into a flat sheet or desired shape on wax paper or a silicone mat.
7. Let the shaped casein dry for 1–2 hours until firm.
8. Observe the texture, flexibility, and durability of the casein plastic and compare to common synthetic plastics (e.g., plastic bags, containers).
9. Discuss potential applications and environmental impacts of biodegradable plastics.

QUESTIONS FOR REFLEXION

What differences did you notice between the casein plastic and synthetic plastics?

How does the source of material (milk protein vs. petroleum-based) affect environmental sustainability?

What are potential uses for biodegradable plastics made from casein?

What limitations or challenges might bio-plastics face compared to synthetic plastics?

TEACHER'S NOTES

Use fresh, full-fat milk for best results.

Monitor heating carefully to avoid boiling milk.

Vinegar should be added slowly to control curdling.

Allow sufficient drying time to achieve firm plastic.

Encourage safe handling and hygiene during the experiment.

Relate the experiment to broader discussions about sustainability in textiles and plastics.

Provide samples of synthetic plastics for comparison if possible.

RESOURCES

Casein plastic DIY guide
https://www.instructables.com/How-to-Make-Casein-Plastic-from-Milk

Video tutorial: "Making Plastic from Milk"
https://www.youtube.com/watch?v=JQpQb4fDyfw

Overview of bio-based plastics
https://www.bpf.co.uk/sustainability/bioplastics.aspx

Casein plastic in fashion and design
https://fashionunited.uk/news/fashion/how-bioplastics-are-changing-the-fashion-industry/2021062954017

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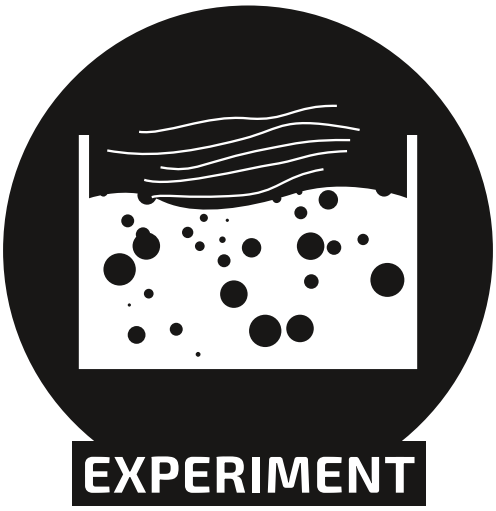
#6

PHASE 2

YARN PRODUCTION (SPINNING)

THE PROCESS OF CONVERTING FIBERS INTO YARNS THROUGH SPINNING OR EXTRUSION TECHNIQUES.



CLEANING FIBRES

AS A PRE-TREATMENT FOR YARN PRODUCTION

Fibres are needed as a raw material to produce yarns and later textile surfaces. Natural fibres such as cotton, linen, hemp and others are cultivated and must be cleaned after harvesting. This pre-treatment stage is necessary in order to be able to process and spin the raw material into high-quality yarns.

Conventional and alternative processes are used to clean natural fibres. Alternative cleaning avoids the use of environmentally harmful substances and utilises resource-saving harvesting and cleaning processes.

In the following experiment, students learn about the different qualities of a raw fibre, which are decisive for its later use as clothing or textiles.

60 Minutes

+ **Kitchen scales with high resolution (several pupils can use one scale, clean after use);**
+ **Container for the impurities**
+ **Clean container for weighing the crude fibre to prevent contamination and thus weight falsification**
+ **Tweezers for cleaning by hand and for administering and removing the crude fibre (one pair of tweezers per pupil is recommended)**
+ **Paper and pen for notes and evaluation**

+ **Cotton raw material**

LEARNING OUTCOMES

Students are able to:

identify and describe impurities in natural fibre materials and calculate the percentage of impurities through weight comparison.

sort cotton fibres by length and explain how fibre length relates to fibre quality and potential textile use.

measure, compare, and interpret weight data to determine the amount of impurities in natural fibres, using simple calculations to support their conclusions.

STEPS

1. Provide each student or group with two ripe, harvested cotton bolls as examples of a natural fibre.
2. Ask the students to weigh the cotton bolls and visually inspect them for impurities (e.g. seeds, leaves, dirt).
3. Have the students remove the impurities carefully by hand and with tweezers.
4. Once cleaned, the cotton is weighed again. Students calculate the percentage of impurities by comparing the before-and-after weights.
5. In the next step, students use tweezers to separate the individual cotton fibres.
6. The fibres are then sorted by length.
7. Based on the varying fibre lengths, students draw conclusions about the quality differences in cotton and how these may affect the fibre's later use (e.g. soft fabrics vs. durable textiles).

QUESTIONS FOR REFLEXION

What types of impurities did you find in the raw cotton, and how did they affect the total weight?

Was it easy or difficult to clean the cotton? What tools or methods worked best?

How did the fibre lengths vary, and what might that tell you about the quality of the cotton?

Why do you think fibre length is important when making textiles or clothing?

What did you learn from weighing the fibres before and after cleaning?

How could this process be useful in the textile industry?

TEACHER'S NOTES

Make sure students understand what they're observing and measuring (e.g. impurities, weight difference, fibre length)

Cleaning and sorting fibres is time-consuming. Plan for at least 45–60 minutes or split the activity across two sessions (cleaning first, sorting and reflection second).

Demonstrate how to weigh fibres correctly before and after cleaning.

If students struggle to sort fibres by length, offer templates or visual guides.

Ensure hands are clean before and after the activity.

Remind students to handle natural materials respectfully, as they're real agricultural products.

Have students work in pairs or small groups to promote collaboration and peer learning.

Encourage them to compare findings and discuss their observations.

RESOURCES

Learning cards for different fibres:
https://padlet.com/CorEdu/textile-revolution-sustainable-textile-education-for-future--v2p0slbq1hjzhhou/wish/E1P8aX8G0EowawA9

The digital learning platform Textil Trainer provides fundamental knowledge about textiles
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#7

PHASE 2

YARN PRODUCTION (SPINNING)

THE PROCESS OF CONVERTING FIBERS INTO YARNS THROUGH SPINNING OR EXTRUSION TECHNIQUES.

FROM FIBRE TO YARN

The pre-treated raw fibre from the fibre extraction process goes on to the spinning mill where it is spun into a so-called loose roving. The use of the respective spinning process depends on whether natural, animal or synthetic fibres are being spun. Coating, protective and lubricating chemicals are often required for the spinning process. Environmentally friendly, recyclable agents can also be used for this purpose.

In the second step, the roving yarn is twisted/twisted in the twisting mill (depending on the quality requirements, in a single or multi-stage process with different shedding, which results in different strengths). The yarn quality produced depends on the subsequent use and corresponds to the requirements of the respective textile or clothing manufacturer.

For yarn production, pure fibre components or fibre blends can be twisted into yarns in specific blending ratios. This depends on the properties that are to be achieved. By combining different fibres, fabrics with optimised properties can be created that are particularly suitable for certain applications or wearing comfort.

In the following experiment, the pupils learn about the structure of a textile surface and learn to distinguish between the different types of textile surfaces.

60 Minutes

+ **Thread magnifier per student**
+ **Tweezers per student**
+ **Paper and pen for notes and evaluation**

+ **3 samples per student of textile surfaces (1x woven fabric, 1x knitted fabric, 1x composite fabric)**

LEARNING OUTCOMES

Students are able to:

observe and describe the structure of textile surfaces and yarns using magnification tools and their own words.

To remove and analyse individual yarns from a fabric and recognise basic characteristics such as twist, texture, and construction.

to experiment with re-twisting yarns and compare how different twists and constructions affect the strength and elasticity of the yarn.

STEPS

1. Give each student or group a sample of textile fabric and a thread magnifying glass (thread counter or linen tester).
2. Ask the students to closely examine the surface of the textile and describe what they see in their own words (e.g. weave, knit, pattern).
3. Instruct the students to carefully remove individual yarns from the textile sample, as much as possible without damaging the rest.
4. Have the students examine the removed yarns under the magnifying glass and describe their structure (e.g. twisted, smooth, fuzzy).
5. Ask the students to experiment by reassembling and twisting the loose yarns to form new yarns.
6. Encourage them to try different twisting methods and observe the differences in strength and elasticity.
7. Guide a discussion or written reflection on how yarn structure and twisting influence the properties of a textile surface.

QUESTIONS FOR REFLEXION

What did you notice about the structure of the textile surface when you looked at it under the magnifying glass?

How did the yarns look or feel different once you removed them from the fabric?

What happened when you twisted the yarns in different ways? How did the twist affect their strength or stretchiness?

Why do you think different yarn structures are used for different types of fabrics or products?

What surprised you most about how textiles are built from yarns?

TEACHER'S NOTES

Provide textile samples with clearly visible structures (e.g. woven cotton, knitted jersey, synthetic blends).

Pre-cut manageable textile pieces to avoid tearing or frustration.

Show how to gently loosen and remove yarns from the textile without pulling or tearing.

Discuss real-world applications of yarn construction in clothing, furnishings, or sportswear.

RESOURCES

From fibre to yarn - the manufacturing process
https://www.youtube.com/watch?v=hNU5lnMnYsw

Spinning cotton yarn
https://www.youtube.com/watch?v=k2GKVG-2qeM

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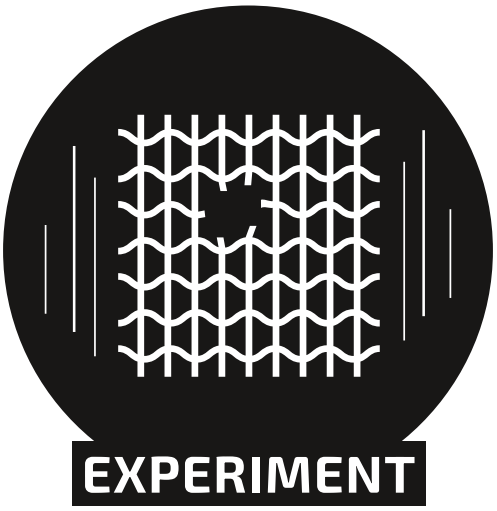
#8

TEXTILE SUPPLY CHAIN

PHASE 3

FABRIC PRODUCTION (WEAVING & KNITTING)

THE TRANSFORMATION OF YARNS INTO FABRICS THROUGH WEAVING, KNITTING, OR NONWOVEN TECHNIQUES.



FABRIC ABRASION RESISTANCE TEST

COMPARING WEAR OF TEXTILE SAMPLES

Students investigate the abrasion resistance of common apparel fabrics by rubbing sandpaper across fabric specimens wrapped around a weighted ball. The low-cost rig approximates industrial Martindale or Wyzenbeek abrasion tests, enabling students to relate fibre type, yarn structure and finishing treatments to fabric durability. This activity is directly relevant to quality control roles in garment production.

60 Minutes

10 MIN – introduction and safety briefing

35 MIN – testing and data recording

10 MIN – analysis and ranking fabrics

5 MIN – debrief and clean-up

Consumables (per group of two)

+ 3 fabric squares (15 × 15 cm): cotton twill/denim, lightweight cotton plain weave, nylon or polyester knit
+ 1 'mystery' fabric square for assessment
+ 1 sheet extra-coarse sandpaper (60–80 grit)
+ Rubber bands or masking tape
+ Printed wear and tear data sheet

+ Baseball or 70 mm wooden sphere (c. 145 g)
+ Magnifying glass or USB microscope
+ Stopwatch or timer app
+ Digital scale (0.1 g) for optional weight-per-area calculation
+ Vacuum or brush for dust clean-up

+ Safety glasses
+ Dust mask (optional if using extensive sanding)
+ Lab coats or aprons

LEARNING OUTCOMES

Students will be able to:

Describe mechanical abrasion mechanisms and key fabric parameters influencing durability.

Conduct a controlled abrasion test and log wear progression using standardized notation.

Interpret results to rank fabrics and justify material selection for specific end-uses.

Follow safe working practices when handling abrasive materials and textile dust.

STEPS

PART 1: OBSERVATION

1. Divide the class into groups of two students each.
2. Give each group one piece of each type of fabric.
3. Have students use magnifying glasses to look closely at each fabric sample.
4. Instruct each group to draw what each fabric weave looks like on the data sheet.

PART 2: FABRIC WEAR AND TEAR

1. Give each group a baseball.
2. Have each group wrap one piece of fabric tightly around the ball and secure with a rubber band. (Note: The tighter the fabric is, the faster the experiment progress.)
3. Within each group, have one partner secure a piece of sandpaper (rough side up) on a table top, while the other partner drags the ball across it. DO NOT PRESS DOWN on the ball, just let the weight of the ball drag once across the sandpaper.

4. Use the magnifying glass to observe the area where the fabric was dragged across the sandpaper. Discussion question: Was there any wear after just one scrape?
5. Have students continue to test the fabric one scrape at a time. Make a tick mark on the data sheet for each scrape. After each successive scrape, examine the area with the magnifying glass, counting each scrape until you notice some wear on the fabric.
6. When students notice some wear on the fabric, have them tally and record the number of scrapes in the chart under "First Wear" for the tested fabric.
7. Have students continue scraping the fabric and counting each scrape until they notice a hole or tear.
8. Record the number of scrapes in the chart under "Breakthrough" for that fabric.
9. Repeat steps 6 -12 for each of the other two fabrics.
10. Rank fabrics by 'cycles to first wear' and 'cycles to breakthrough'; discuss variance.
11. Clean-up – Collect stray fibres, dispose sandpaper safely, vacuum dust.

QUESTIONS FOR REFLEXION

Which fabric exhibited the highest abrasion resistance and why?

How did weave density or yarn thickness influence the wear profile?

In what ways could chemical finishes (e.g., resin, anti-pilling) alter abrasion performance?

How might results guide material selection for workwear, upholstery, or sportswear?

How does this classroom method differ from ISO 12947 (Martindale) in terms of control and repeatability?

TEACHER'S NOTES

Standards link – ISO 12947 (Martindale) and ASTM D4966 outline industrial abrasion testing; highlight similarities and limitations of the classroom method.

Safety – Fine fibres and dust may irritate eyes; ensure eyewear and encourage gentle brushing rather than blowing.

Differentiation – Advanced groups calculate wear rate (cycles/mm^2 mass loss) or test additional fabrics such as recycled PET blends.

Common pitfalls – Pressing down on the ball skews results; remind students to use only the weight of the ball.

Assessment – Collect completed data sheets, plus a brief justification of fabric ranking aligned to an application scenario.

RESOURCES

TeachEngineering. (2017, May 25). *Compare Fabric Materials* [Activity]. Regents of the University of Colorado. https://www.teachengineering.org/activities/view/compare_fabric_materials

International Organization for Standardization. (2016). *Textiles — Martindale abrasion testing* (ISO 12947).

WEAR AND TEAR DATA SHEET

Type of Fabric		Number of Scrapes	
		First Wear	Breakthrough
1			
2			
3			

CAREER GUIDANCE:
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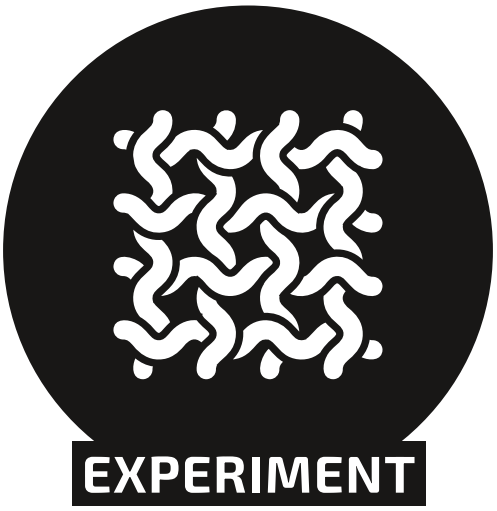
#9

PHASE 3

FABRIC PRODUCTION (WEAVING & KNITTING)

THE TRANSFORMATION OF YARNS INTO FABRICS THROUGH WEAVING, KNITTING, OR NONWOVEN TECHNIQUES.



THE CLASSIC DECORATIVE TECHNIQUE SMOKING

Before synthetic fibres and the associated fibre blends and possibilities to influence the properties of textile surfaces were developed, old handicraft techniques were used in the tailoring of clothing.

Due to the use of inelastic natural fibres such as nettle, linen, cotton etc. and weaving in plain weave, techniques were needed to change/regulate widths such as lacing, closing with buttons or gathering with ribbons. Smocking was a new technique to achieve an elastic effect and at the same time create a decorative structure on the garment.

Today, the smocking technique is still used with an elastic yarn and is 100% elastic compared to the hand smocking technique.

However, this technique is basically unnecessary if the decorative purpose is not to be fulfilled at the same time, as fibre blends with elastane give the desired shape.

Students compare the elasticity and structural effect of traditional hand-smocking using inelastic natural fibres with modern smocking using elastic yarns, to explore how material properties and textile techniques influence garment functionality.

90 Minutes

+ **one cut piece of non-elastic fabric per student**

+ **hand sewing needle, thread and small scissors per student**

+ **pencil, piece of paper and ruler with a length of 30cm per pupil**

LEARNING OUTCOMES

Students are able to:

measure and compare textile surface dimensions before and after smocking, using basic mathematical calculations to determine the percentage of surface reduction.

understand how the mechanical manipulation of inelastic fibres through hand techniques can create functional properties such as elasticity.

apply systematic procedures (marking, stitching, gathering, fixing) to create a repeatable textile modification and evaluate its practical and decorative effects.

STEPS

1. Measure and record the original length of the textile surface before starting the smocking process.
2. On the left side of the fabric, have the students lightly mark a grid of smocking dots using a thin pencil. The spacing should be even and adapted to the desired pattern (e.g. 1 cm or 1.5 cm apart).
3. Thread a needle with basting thread, and instruct the students to sew hand basting stitches through the smocking dots in horizontal rows (basting lines).
4. Pull the threads gently to gather the fabric. This creates evenly spaced folds along each row.
5. Secure the folds by stippling small stitches in a diamond pattern at each seam break. This step fixes the folds into place and forms the classic smocking texture.
6. Once the smocking is complete, have the students measure the new width of the fabric.
7. Calculate the change in fabric length and compare it to the original. Students can then determine the percentage of reduction and reflect on the elasticity effect achieved through this traditional decorative technique.

QUESTIONS FOR REFLEXION

What changes did you observe in the fabric after applying the smocking technique?

How did your measurements before and after smocking help you understand the effect of gathering on fabric length and elasticity?

Why do you think smocking was used in the past as a solution for shaping garments made from inelastic fibres?

How does the smocking technique compare to modern elastic materials in terms of function and appearance?

What did you find challenging or interesting about applying a traditional textile technique to create a functional effect?

TEACHER'S NOTES

Show students how to mark the smocking dots evenly on the back of the fabric using a grid.

Demonstrate how to stitch the basting lines and gather the fabric gently.

Remind students that precision matters more than speed.

Monitor the use of needles and scissors carefully.

Provide clear instructions for safe disposal or collection of sewing tools.

RESOURCES

How to do smoking technique - demonstration
https://www.youtube.com/watch?v=01TDdlq0jMo

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#10

TEXTILE SUPPLY CHAIN

PHASE 4

PRE-TREATMENT (SCOURING, BLEACHING, MERCERIZING)

CLEANING AND PREPARING THE FABRIC BY REMOVING NATURAL IMPURITIES, OILS, AND WAXES.

NATURAL FABRIC WHITENING

WITH LEMON AND SUNLIGHT

Students will explore natural bleaching by treating cotton fabric samples with lemon juice and exposing them to sunlight. This experiment demonstrates a gentle, eco-friendly alternative to chemical bleaching used in textile production. By observing changes in fabric whiteness over time, students learn about natural bleaching's effectiveness, environmental benefits, and potential limitations.

~ 2–3 hours

15–20 MINUTES Preparation and application

1.5–2 HOURS (can be adjusted depending on sunlight intensity) Sunlight exposure

15–30 MINUTES Observation and analysis

- Small cotton fabric squares or strips (pre-washed, light-colored)
- Optional: control fabric samples untreated or treated with water only
- Fresh lemon juice or bottled lemon juice

- Spray bottles or small containers for soaking
- A sunny outdoor area or windowsill with strong sunlight
- Gloves (optional, to protect hands from acidity)
- Water for rinsing
- Paper towels or cloths for drying
- Notebook or worksheet for observations

LEARNING OUTCOMES

The student is able to:

Explain the concept of natural bleaching and its environmental benefits.

Apply lemon juice as a natural bleaching agent to fabric samples.

Design and conduct an experiment to observe the bleaching effect of natural agents.

Record and analyze changes in fabric whiteness over time.

STEPS

1. Prepare cotton fabric samples of equal size and ensure they are clean and dry.
2. Divide samples into groups:
   - Treatment group: soak or spray samples evenly with lemon juice.
   - Control group: keep samples untreated or sprayed with water only.
3. Place all samples in direct sunlight on a clean surface or windowsill.
4. Leave the samples exposed for 1.5 to 2 hours, checking periodically.
5. Remove samples from sunlight and rinse gently with water to stop the bleaching process.
6. Dry the samples and observe changes in whiteness and fabric condition.
7. Record observations and compare treated versus control samples.
8. Discuss results, sustainability implications, and possible improvements.

QUESTIONS FOR REFLEXION

How did lemon juice and sunlight affect the cotton samples compared to untreated samples?

Why might natural bleaching be preferable to chemical bleaching in textile production?

What limitations or challenges did you observe with this natural bleaching method?

How might fabric type, lemon concentration, or exposure time influence results?

Can you suggest other natural substances that might have bleaching effects?

TEACHER'S NOTES

Use light-colored cotton to better observe whitening effects.

Ensure safe handling of lemon juice; gloves can protect sensitive skin.

Adapt sunlight exposure time based on weather and intensity; cloudy days may require longer.

Encourage students to take photos before and after exposure for better comparison.

Optionally, discuss chemistry behind lemon juice (citric acid) and UV light in bleaching.

RESOURCES

Natural bleaching experiment overview
https://www.instructables.com/Natural-Bleaching-With-Lemon

Video tutorial: “Natural Fabric Bleaching with Lemon Juice”
https://www.youtube.com/watch?v=9FqGg6uT9Zo

Sustainable textile bleaching insights
https://www.textileworld.com/textile-world/features/2019/10/sustainable-bleaching-methods

Basic chemistry of lemon juice bleaching
https://sciencing.com/citric-acid-chemical-properties-8255924.html

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#11

TEXTILE SUPPLY CHAIN

PHASE 5

DYEING & PRINTING

APPLYING COLORS AND PATTERNS USING DYEING, PRINTING, OR PIGMENT APPLICATION TECHNIQUES.

NATURAL DYEING WITH PLANT-BASED MATERIALS

Students extract colourants from readily available botanicals (e.g., black tea, blackberries, onion skins) and dye small cotton, wool and synthetic swatches.

The activity highlights how sustainable, low-toxicity dyes can replace or complement synthetic colourants in vocational settings.

SESSION 1 – **45 min**
Introduction, scouring and mordanting

SESSION 2 – **60 min**
Dye extraction (30 min simmer), dyeing and rinse

FOLLOW-UP – **15 min** next lesson
Drying review, discussion and assessment

CONSUMABLES

+ 200 g loose black tea / 300 g fresh blackberries / 200 g mixed onion skins (choose 1–2 sources)
+ 60 g alum (potassium aluminium sulphate) mordant
+ 30 g cream of tartar (optional brighter colours)
+ 12 × 10 cm cotton squares
+ 12 × wool squares
+ 12 × polyester squares
+ pH test strips

Note: Botanicals can be swapped for local seasonal plants.

TOOLS & EQUIPMENT

+ Two stainless-steel stockpots (6 L)
+ Electric hotplates or induction hobs
+ Thermometers (0–100 °C)
+ Fine mesh strainers or muslin cloth
+ Stirring paddles/tongs
+ Digital scale (0.1 g resolution)

Note: Avoid aluminium pots (reacts with mordant).

PPE & LABWARE

+ Heat-resistant gloves
+ Aprons
+ Safety glasses
+ Lab notebooks & waterproof markers

LEARNING OUTCOMES

Students are able to:

describe the chemical processes involved in natural dye bonding to fibers and explain the function of mordants.

compare how different fiber types—cellulosic, protein-based, and synthetic—absorb dyes.

evaluate and compare the environmental impacts of natural dyeing methods versus synthetic dyeing processes.

STEPS

1. Pre-treat (teacher demo): Scour all fabric samples in 60 °C soapy water for 10 min; rinse.
2. Mordant bath: Dissolve alum (15 % owf) and cream of tartar (5 % owf) in 4 L warm water. Add damp samples; simmer 45 min at 90 °C, stirring. Cool overnight or at least 30 min.
3. Prepare dye liquor: Rough-chop plant material, add to 4 L water, heat to gentle boil and simmer 30 min. Strain into clean pot to remove solids.
4. Dyeing: Add mordanted swatches. Maintain 80 °C for 20 min, stirring gently. Monitor colour depth; adjust pH with small amounts of vinegar (acid) or soda ash (alkaline) to demonstrate hue shifts.
5. Cooldown and rinse: Remove samples, allow to cool, rinse in cold water until clear, and air-dry.
6. Documentation: Students photograph before/after, record bath temperature, pH, time, and subjective colourfastness.
7. Optional fastness test: Light-fastness — expose half of each swatch to sunlight for one week; wash-fastness — launder one set on a 30 °C cycle and compare.

QUESTIONS FOR REFLEXION

Which fibre showed the strongest/weakest affinity for each botanical dye? Why?

How did pH manipulation alter hue or intensity?

Consider industrial scalability: what hurdles exist when replacing synthetic dyes with plant-based alternatives?

What additional sustainable practices (e.g., rain-water reuse) could enhance this process?

TEACHER'S NOTES

Safety

Hot liquids; enforce PPE. Tea/berry extracts can stain skin; gloves compulsory.

Differentiation

Assign advanced students to calculate liquor-ratio maths or design a mini-colour-fastness experiment.

Green practice

Compost spent plant matter; neutralise and cool dye baths before disposal via wastewater system.

Common pitfalls

Uneven dyeing from inadequate stirring; colour loss if mordant concentration too low.

Assessment tips

Use a rubric covering lab technique (30 %), data recording (30 %), and reflection quality (40 %).

RESOURCES

Byrd, S. (2024). *STEM Activities in the Clothing and Textiles Project Area (W 881)*. University of Tennessee Extension. Retrieved from https://4h.tennessee.edu/wp-content/uploads/sites/47/2024/11/W881-stem-Clothing-and-Textiles-Lessons.pdf

Cambridge University Botanic Garden. (n.d.). *Dyes from Plants*. Retrieved from https://www.botanic.cam.ac.uk/learning/trails/dyestrail

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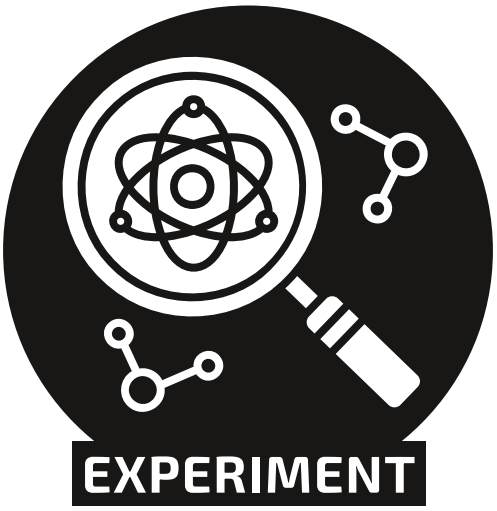
#12

TEXTILE SUPPLY CHAIN

PHASE 6

FINISHING (CHEMICAL & MECHANICAL TREATMENTS)

ENHANCING FABRIC PROPERTIES SUCH AS SOFTNESS, DURABILITY, WRINKLE RESISTANCE, OR WATER REPELLENCY.



SPACE TEXTILES

WHAT DO YOU WEAR TO FLOAT IN SPACE?

In extreme environments like space, clothing is not about style—it's about survival. Astronauts require high-performance textiles that regulate body temperature, protect against radiation, manage moisture, and allow for freedom of movement in weightlessness. These functional needs are driving innovation in textile technology—innovations that increasingly influence the fashion industry on Earth. This experiment encourages you to think like a fashion technologist—someone who combines design, engineering, and materials science to develop clothing for real human needs in extreme conditions. It's where the future of fashion meets functionality.

75 Minutes

+ **Desks and chairs**
+ **A projector**
+ **A computer for the teacher**
+ **A physical/digital board; Internet connection for all participants**
+ **A paper or virtual space for writing notes and drawing sketches for students**

LEARNING OUTCOMES

Students are able to:

describe the environmental challenges of space and other extreme environments and explain how these influence the design of functional clothing.

identify and evaluate key properties of technical textiles such as insulation, breathability, stretchability, moisture management, and radiation protection.

analyse how innovations developed for space or high-tech industries are adapted and applied in the fashion industry (e.g. smart fabrics, thermal wear, sustainability).

use design thinking to propose clothing solutions for extreme conditions, applying creativity, problem-solving, and knowledge of textile functionality.

reflect on how fashion can respond not only to trends but also to human needs, environmental challenges, and future-oriented technological change.

STEPS

1. Present the concept of clothing in space and the connection between technical textiles and fashion innovation. Explain environmental challenges in space such as radiation, temperature fluctuation, zero gravity, and lack of breathable air.
2. Students write down their assumptions about the clothing needs of astronauts—both inside the spacecraft and during spacewalks—and the types of textiles or features that might be necessary.
3. Show a video or provide material on real space clothing and space suits. Students compare their initial hypotheses with the actual solutions used in the space industry.
4. Each group chooses or receives a different non-Earth environment (e.g. Arctic, desert, deep sea, toxic atmosphere) with specific environmental conditions that require specialised clothing.
5. Students identify the physical conditions of the chosen environment (e.g. temperature, pressure, exposure, mobility requirements) and define the risks or needs the body would face.
6. Students determine which textile properties are necessary (e.g. insulation, moisture control, flexibility, protection) and which fibres, coatings, or technologies could meet those needs.
7. Students design or describe a clothing item suitable for the selected environment. The concept includes function-focused features, textile selection, and possible links to fashion applications on Earth.
8. Students create a visual sketch or poster and present their solution to the class, explaining the environment, material choice, and function of the clothing.
9. Students reflect on the results

QUESTIONS FOR REFLEXION

How might rising temperatures, extreme weather, or increased UV exposure influence the way clothing is designed in the future?

What types of new materials or textile technologies do you think will become necessary as climate conditions change?

How can fashion balance function (e.g. protection, regulation) with sustainability in a changing environment?

In which ways could smart textiles or adaptive clothing play a role in climate resilience?

TEACHER'S NOTES

Explain the goal: to explore how textiles and fashion must adapt to extreme environments—space, deep sea, or Earth affected by climate change.

Emphasise the link between fashion, materials science, environmental challenges

Help students link textile functions to environmental conditions:

Heat = need for breathability, UV protection
Cold = insulation, wind resistance
Lack of oxygen = sealed design, filtration

RESOURCES

Out of this world – NASA's textile technicians and innovations for space voyages
https://room.eu.com/article/out-of-this-world--nasas-textile-technicians-and-innovations-for-space-voyages

Textiles in Air & Space Travel
https://www.fibre2fashion.com/industry-article/9844/textiles-in-air-space-travel

Space clothes
https://www.youtube.com/watch?v=lYnOs3lGL88

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- Cotton fabric (or other natural fabric squares, ~15x15 cm)
- Beeswax or paraffin wax (in small blocks or pellets)
- Water (for testing repellency)

- Clothes iron or hair dryer (to melt the wax into the fabric)
- Parchment paper or baking paper (to protect surfaces while ironing)
- Towel or ironing board (as a heat-safe work surface)
- Dropper or spoon (for water testing)
- Paper towels (for cleanup)
- Scissors (to cut fabric, if needed)
- Heat-resistant gloves or tongs (optional, for safety when handling hot fabric)

LEARNING OUTCOMES

Students are able to:

measure and compare textile surface dimensions before and after smocking, using basic mathematical calculations to determine the percentage of surface reduction.

understand how the mechanical manipulation of inelastic fibres through hand techniques can create functional properties such as elasticity.

apply systematic procedures (marking, stitching, gathering, fixing) to create a repeatable textile modification and evaluate its practical and decorative effects.

STEPS

1. Create a heat-safe area by placing a towel or using an ironing board. Cover it with parchment paper to protect the surface from wax.
2. Cut fabric squares to a manageable size (e.g. 15 × 15 cm). Give one piece to each student or group.
3. Use a cheese grater to shred beeswax or paraffin into fine flakes. (Prepare this step in advance for younger students if needed.)
4. Evenly sprinkle a thin layer of wax flakes over the fabric surface, ensuring light but full coverage.
5. Place a second sheet of parchment paper over the waxed fabric. Use a medium-heat clothes iron (no steam) to gently press the wax into the fabric. Alternatively, use a hair dryer on high heat to melt and distribute the wax.
6. Let the fabric cool completely, so the wax hardens and binds to the fibres.
7. Place the waxed fabric on a flat surface. Drop small amounts of water onto the fabric using a spoon or dropper. Observe whether the water beads up or is absorbed.
8. Repeat the same water test on an untreated fabric sample to compare water behaviour.
9. Have students reflect on how the wax changed the fabric's properties. Discuss where and why water-repellent textiles are used in everyday products and industry.

QUESTIONS FOR REFLEXION

What differences did you notice between the wax-treated fabric and the untreated fabric when you tested them with water?

How do you think the wax changed the structure or surface of the fabric to make it repel water?

What worked well during the waxing process, and what was challenging?

In what types of clothing or products do you think this waterproofing method could be useful?

How does this experiment help you understand the science behind how textiles are made functional for different weather or activity conditions?

TEACHER'S NOTES

Use ironing boards or cover desks with thick towels and parchment paper to protect surfaces.

Supervise students closely when using heat tools — assign one iron per group, or have an adult operate the iron if needed.

If using hairdryers, ensure cords don't cause tripping hazards and monitor use.

Show students how to apply a light, even layer of wax flakes.

Wax can be messy. Have tissues, paper towels, or cloths ready for clean-up.

Ask students to gently remove any wax residue from irons if needed (while cool).

RESOURCES

How to make Beeswax Fabric - demonstration
https://www.youtube.com/watch?v=Ai9ldAba8gQ

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#14

TEXTILE SUPPLY CHAIN

PHASE 6

FINISHING (CHEMICAL & MECHANICAL TREATMENTS)

ENHANCING FABRIC PROPERTIES SUCH AS SOFTNESS, DURABILITY, WRINKLE RESISTANCE, OR WATER REPELLENCY.

TESTING FABRIC STRENGTH AND DURABILITY

Students will assess the strength and durability of various fabric samples by applying weights and performing abrasion tests using sandpaper. This hands-on activity helps students understand how different textiles perform under stress and wear, highlighting the importance of fabric choice and finishing processes in fashion and textile applications.

~60 Minutes

10 MINUTES Preparation and setup

20 MINUTES Weight strength testing

20 MINUTES Abrasion test

10 MINUTES Observation, recording, and discussion

- Fabric samples of different types (e.g., cotton, denim, polyester, silk, canvas)

- Weights (small bags of sand, metal weights, or water bottles)
- Sandpaper sheets (medium grit, e.g., 120–150 grit)
- Clips or clamps to hold fabric samples
- Ruler or measuring tape
- Stopwatch or timer
- Notebook or worksheet for recording observations
- Optional: tensile testing setup or spring scale for measuring force

LEARNING OUTCOMES

Students are able to:

Conduct basic strength and abrasion tests on different fabric types.

Observe and compare fabric performance under mechanical stress.

Understand the relationship between fabric structure and durability.

Explain how finishing processes can enhance fabric strength and wear resistance.

STEPS

1. Prepare fabric samples of uniform size and label them clearly.
2. For strength testing:
   - Secure one end of a fabric strip using a clamp.
   - Gradually add weights to the free end until the fabric tears or stretches significantly.
   - Record the maximum weight held by each fabric type.
3. For abrasion testing:
   - Place a fabric sample on a flat surface.
   - Rub a piece of sandpaper over a designated area with consistent pressure for a set number of strokes or time (e.g., 50 strokes).
   - Examine the fabric for signs of wear, thinning, or holes and record observations.
4. Repeat tests for all fabric types.
5. Compare results and discuss which fabrics are more suitable for heavy-use or delicate applications.

QUESTIONS FOR REFLEXION

Which fabric showed the highest strength under weight? Why do you think that is?

How did different fabrics respond to abrasion? Were some more resistant than others?

What role does fabric weave or fiber type play in durability?

How can finishing treatments improve fabric performance?

Based on your results, which fabrics would you recommend for sportswear, workwear, or formal clothing?

TEACHER'S NOTES

Prepare fabric samples and weights ahead of time to maximize class time.

Ensure students apply consistent pressure and strokes during abrasion tests.

Emphasize safety when handling weights and clamps.

If tensile testing equipment is unavailable, simple weight tests provide useful insights.

RESOURCES

Fabric strength and abrasion testing basics
https://textilelearner.blogspot.com/2017/06/fabric-strength-and-abration.html

Video: “Fabric Strength Test”
https://www.youtube.com/watch?v=1RLtNRW3Z2s

Abrasion resistance explained
https://www.fibre2fashion.com/industry-article/6547/abrasion-resistance-in-textiles

Textile finishing processes
https://www.textiletoday.com.bd/textile-finishing-processes

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#15

TEXTILE SUPPLY CHAIN

PHASE 7

GARMENT MANUFACTURING (CUTTING & SEWING)

CONVERTING FINISHED TEXTILES INTO CLOTHING, HOME TEXTILES, OR TECHNICAL TEXTILES.

NO-SEW VS. SEW

WHICH SEAM IS STRONGER?

In this experiment, students will compare different methods of joining fabric strips: sewing, gluing, and mechanical fastening (such as staples or tape). They will create seams using each technique and then test the strength and durability of these seams by applying tension or weight until failure occurs. Through this hands-on activity, students will analyze which method produces the strongest and most reliable seam, gaining insight into the importance of sewing in textile construction and design.

60–90 Minutes

30–45 MINUTES Preparation and seam making
15–20 MINUTES Testing and observation
15–25 MINUTES Analysis and discussion

- Fabric strips (e.g., cotton or polyester, standardized size such as 30 cm × 5 cm)
- Sewing needles and thread (or a sewing machine if available)
- Fabric glue
- Staples or strong adhesive tape (e.g., duct tape)
- Scissors
- Ruler or measuring tape
- Weights (e.g., small bags of sand, water bottles, or textbooks) or tension testing setup
- Clamp or sturdy hook for attaching fabric strips during testing
- Notebook or worksheet for observations and data recording

LEARNING OUTCOMES

Students will be able to:

Identify and describe different methods for joining fabrics in textile construction.

Construct fabric seams using sewing, gluing, and mechanical fastening.

Design and perform a test to compare the strength and durability of different seam methods.

Analyze experimental data to determine which seam method is strongest and most reliable.

Understand why sewn seams are commonly used in garment construction due to their flexibility and durability.

Reflect on the practical applications and limitations of different seam techniques.

STEPS

1. Prepare fabric strips of equal size (suggest 30 cm long × 5 cm wide). Prepare at least three samples per seam method for reliability.
2. Join the fabric strips in pairs using three different methods:

   Sew a seam along one edge using needle and thread (simple straight stitch).

   Glue the edges together with fabric glue, allowing sufficient drying time per glue instructions.

   Fasten the edges using staples or tape, ensuring secure attachment.
3. Set up a testing station where each fabric pair can be clamped at one end. Attach weights gradually or pull to apply tension until the seam breaks or fails.
4. Record the amount of weight or tension each seam withstands before failure.
5. Repeat for all samples and calculate average strength per method.
6. 6. Discuss results and encourage students to relate findings to real-world textile applications.

QUESTIONS FOR REFLEXION

How did the different methods behave under stress? Were some more flexible or rigid?

What are the advantages and disadvantages of sewing compared to gluing and mechanical fastening?

Can you think of scenarios where a no-sew method might be preferable despite lower strength?

TEACHER'S NOTES

Prepare materials in advance to save time during the session.

Emphasize safety when using needles, scissors, and staplers.

Allow sufficient drying time for glue if possible; if not feasible during class, use pre-glued samples.

Encourage students to handle materials carefully to ensure accurate testing.

Guide students in measurement and data recording for better scientific rigor.

If weights or tension setups are unavailable, creative alternatives like hanging water bottles or using a spring scale can be used.

RESOURCES

Video tutorial on simple sewing stitches
https://www.youtube.com/watch?v=5-z-Lw9nm4o

Explanation of fabric joining methods
https://www.threadsmagazine.com/2016/05/03/how-to-sew-a-basic-seam

Fabric glue vs. sewing discussion
https://www.craftsy.com/post/fabric-glue-vs-sewing

CAREER GUIDANCE:
STEM IS IN VOGUE

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CorEdu, Germany

Eurocultura, Italy

GoSpark , Slovenia

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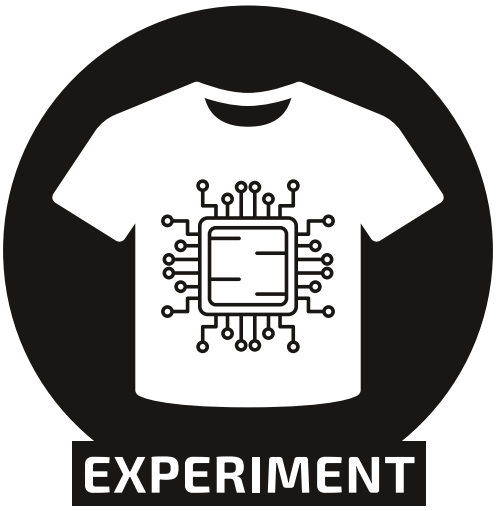
#16

PHASE 7

GARMENT MANUFACTURING (CUTTING & SEWING)

CONVERTING FINISHED TEXTILES INTO CLOTHING, HOME TEXTILES, OR TECHNICAL TEXTILES.



E-TEXTILES...

BUT SUSTAINABLE!

Electronic textiles, or e-textiles, are fabrics that integrate electronic components such as lights, sensors, microcontrollers, or heating elements. These textiles can serve functional purposes—like regulating body temperature—or create visual effects purely for aesthetic expression. As wearable technology becomes increasingly common, the line between clothing and electronics continues to blur.

In this experiment, students create their first simple e-textile and explore how fashion and electronics interact. Beyond the technical experience, they are invited to reflect on the environmental impact of such innovations.

120–180 Minutes

- Desks and chairs
- A projector
- A computer for the teacher
- A few slides to present the concept of e-textiles (if possible)
- A piece of fabric
- Some micro-leds and batteries for the students to work with, to create their own textile

LEARNING OUTCOMES

Students are able to:

explain how electronic components such as LEDs, sensors, or microcontrollers can be integrated into textiles to create interactive or functional garments.

construct a simple e-textile prototype by combining basic electronic circuits with fabric

analyse the sustainability challenges of e-textiles and propose ideas for more eco-friendly solutions, such as reusable modules, energy-efficient systems, or recyclable components.

STEPS

1. Present to the group the concept of "E-textiles" and some existing examples
2. (if possible) Make them familiarise with a real E-textile by seeing, touching, and using it
3. Conduct a guided session of a small e-textile creation with the students
4. Create a final moment of discussion and reflection on e-textiles and sustainability (30min)

QUESTIONS FOR REFLEXION

Can you think of other potential (and beneficial) uses of e-textiles?

Are there risks in using these technologies?

If yes, how to prevent them?

TEACHER'S NOTES

Introduce the concept of e-textiles by showing real-life examples (e.g. heated jackets, LED fashion, biometric sportswear) to help students connect the topic to both innovation and everyday applications in fashion.

Encourage students to think beyond the technical aspect by discussing sustainability issues—such as the lifespan of components, reusability, and electronic waste—during or after the hands-on activity.

Allow time for testing, troubleshooting, and creative customisation. Support students in seeing both the functional and expressive potential of combining electronics with fashion.

RESOURCES

What is the clothing of the future: SMART wearables & e-textiles
https://www.youtube.com/watch?v=o91f2wmpJRQ

EcoThreads: Prototyping Biodegradable E-textiles Through Thread-based Fabrication
https://www.youtube.com/watch?v=lvEtmrEWI88

Electronic textile
https://www.youtube.com/watch?v=y9D33GiF6VQ

Top 9 technology trends reshaping fashion
https://techpacker.com/blog/design/top-09-fashion-technology-trends

Technology trends in fashion
https://www.youtube.com/watch?v=A_zZq2XABxw

Technology
https://www.voguebusiness.com/technology

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#17

TEXTILE SUPPLY CHAIN

PHASE 7

GARMENT MANUFACTURING (CUTTING & SEWING)

CONVERTING FINISHED TEXTILES INTO CLOTHING, HOME TEXTILES, OR TECHNICAL TEXTILES.

WHY PATTERN DESIGNS ARE NOT SUITABLE FOR ALL FABRICSDESCRIPTION

Students will investigate how different physical properties of fabrics—such as elasticity, thickness, and surface texture—affect the suitability of various sewing patterns. By transferring the same garment pattern onto different fabric types, sewing them, and analyzing the outcomes, students learn why certain patterns work better with specific fabrics. This experiment highlights the importance of fabric choice in garment construction and design.

90–120 Minutes

- Various fabric samples with different properties (e.g., stretchy knit, thick denim, smooth silk, woven cotton)
- Pre-made simple garment pattern pieces (e.g., a basic sleeve, bodice, or skirt pattern)

- Fabric scissors
- Pins and needles or sewing machines
- Measuring tape or ruler
- Tailor's chalk or fabric markers
- Iron and ironing board
- Worksheets or notebooks for recording observations

LEARNING OUTCOMES

Students are able to:

Identify key physical properties of different fabrics (elasticity, thickness, texture).

Understand how fabric properties influence the choice and effectiveness of garment patterns.

Transfer a sewing pattern accurately onto different fabric types.

Construct simple garment pieces using appropriate techniques for each fabric.

Analyze and compare how the same pattern behaves on various fabrics.

Explain why certain patterns are unsuitable for some fabric types and the impact on fit and appearance.

STEPS

1. Introduce the fabric properties and discuss common types of garment patterns.
2. Distribute fabric samples and the same garment pattern pieces to student groups.
3. Guide students to transfer the pattern onto each fabric using tailor's chalk or fabric markers.
4. Cut out the fabric pieces carefully.
5. Sew the fabric pieces according to the pattern, using hand sewing or a machine as available.
6. Observe and document how each fabric responds to the pattern—consider fit, ease of sewing, shape retention, and appearance.
7. Facilitate a discussion comparing results and linking fabric characteristics to pattern suitability.

QUESTIONS FOR REFLEXION

How did the fabric's elasticity affect the garment shape and fit?

Which fabric was easiest or hardest to sew with this pattern? Why?

Did the thickness or texture of the fabric cause any issues during construction?

How did the fabric choice affect the overall look of the garment piece?

Why might a pattern designed for woven fabric not work well on knits (or vice versa)?

How does understanding fabric properties help designers create better garments?

TEACHER'S NOTES

Prepare fabric samples of similar sizes for consistency.

Use simple, beginner-friendly patterns to focus on fabric effects rather than complex construction.

Provide extra time for hand sewing if machines are unavailable.

Encourage students to take photos or notes to document differences.

Link this experiment to broader lessons on textile science, design, and garment engineering.

Consider including a short demo on fabric stretch and drape testing.

RESOURCES

Understanding fabric properties
https://www.threadsmagazine.com/2018/04/24/fabric-properties-fiber-content

Sewing patterns and fabric compatibility
https://www.sewnews.com/2017/11/how-to-choose-the-best-fabric-for-your-pattern

Video: “How Fabric Type Affects Sewing”
https://www.youtube.com/watch?v=gJRSJYny4b8

Basics of fabric behavior
https://www.craftsy.com/post/fabric-properties-guide

Pattern making and fabric choice
https://fashionista.com/2016/09/fabric-pattern-sewing-tips

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#18

TEXTILE SUPPLY CHAIN

PHASE 8

RETAIL & CONSUMER USE

DISTRIBUTION, MARKETING, AND CONSUMER PURCHASING, INCLUDING THE USAGE AND MAINTENANCE (WASHING, DRYING) OF TEXTILES.

THE ECOLOGICAL FOOTPRINT OF A GLOBAL FASHION SHOW

Fashion shows may seem glamorous, but behind the scenes they involve high levels of energy use, long-distance travel, textile production, and waste generation. From the CO_2 emissions of international flights and lighting systems to the environmental impact of producing dozens of outfits, a single large-scale fashion show leaves a significant ecological footprint.

In this experiment, students analyse and calculate the environmental impact of such an event. By examining areas like transportation, energy consumption, and textile production, students will explore how technology and engineering influence sustainability in the fashion industry—and consider what a more eco-friendly alternative could look like.

90 Minutes

+ **Laptops for students with internet connection**
+ **Paper /Flipchart for the presentation of the results**

LEARNING OUTCOMES

Students are able to:

identify and analyse the main components that contribute to the ecological footprint of large-scale fashion events (e.g. transport, energy use, production, waste).

apply research strategies and evaluate data sources to investigate the environmental effects of human activities in the fashion industry.

develop and present alternative solutions to reduce environmental impact, showing an understanding of how design and engineering can support sustainable change.

reflect critically on the environmental and social consequences of global consumption patterns and connect them to personal and collective responsibility.

STEPS

1. Start with a discussion on what happens behind the scenes of a global fashion show (e.g. New York, Paris, Milan).
2. Define what "ecological footprint" means in this context: emissions, energy use, transport, production, waste, etc.
3. Divide the class into small groups, each focusing on one component of the fashion show:

   Group 1 – Travel and transport (flights, freight, local transport for guests, models, staff)

   Group 2 – Energy consumption (lighting, sound systems, venue operations)

   Group 3 – Textile and garment production (materials used, number of outfits, fast fashion impact)

   Group 4 – Waste generation (single-use props, packaging, catering waste)

   Group 5 – Audience and media (digital reach, live streaming, device use, social media)

4. Collect and estimate relevant data

   CO_2 emissions per flight or km travelled

   Energy used per hour of lighting/sound

   Emissions per kg of fabric or item of clothing

   Waste output in kg or litres per attendee

5. Calculate the environmental impact
6. Each group shares their results and ideas in a short presentation or as part of a collective exhibition/poster wall.

QUESTIONS FOR REFLEXION

What did you find most surprising about the environmental impact of a global fashion show?

What could be done differently to make fashion shows more sustainable in the future?

How does this experiment change the way you think about fashion events, consumption, or clothing in general?

How can science, technology, engineering, and mathematics help us solve problems in industries like fashion?

TEACHER'S NOTES

Start by explaining that even creative industries like fashion have a measurable environmental impact.

Encourage them to question sources:
How reliable? How current? What assumptions are being made?

Let students be curious and exploratory – different results spark discussion.

RESOURCES

The environmental impact of fashion weeks
https://www.nssmag.com/en/fashion/38346/environnemental-impact-fashion-week-alarming

Carbon footprint and sustainable fashion
https://www.thegreensideofpink.com/style-en/fashion/2023/sustainable-parade/?lang=en

Fast fashion and the environmental impact
https://earth.org/fast-fashions-detrimental-effect-on-the-environment

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#19

PHASE 8

RETAIL & CONSUMER USE

DISTRIBUTION, MARKETING, AND CONSUMER PURCHASING, INCLUDING THE USAGE AND MAINTENANCE (WASHING, DRYING) OF TEXTILES.

DESIGN YOUR (REAL OR VIRTUAL) STORE!

The fashion industry is undergoing a transformation driven by digital technology, sustainability, and changing consumer behaviour. Traditional retail models are being reimagined: physical stores are integrating smart systems, while virtual shops are becoming immersive, data-driven environments. Understanding these changes is essential for anyone interested in fashion's future.

This experiment invites students to reflect on what a fashion store might look like in the years ahead—not just in terms of design, but in how it functions, serves customers, and responds to global challenges.

90 Minutes

- Desks and chairs
- A projector
- A computer for the teacher
- A physical/digital board; Internet connection for all participants
- A paper or virtual space for writing notes and drawing sketches for students

LEARNING OUTCOMES

Students are able to:

explore the topic of virtual and physical store design.

to use a new digital tool.

draft a personal idea of sales store.

STEPS

1. Introduction to the topic of store design
2. Presentation of the software to be explored during the activity
3. Familiarisation with the tool by the students individually and Q&A
4. Practical session: students sketch their ideal store individually
5. Finally, all students briefly display their work in plenary

QUESTIONS FOR REFLEXION

What are the advantages and disadvantages of having only a physical shop, or only a virtual one?

What features did you include in your store concept, and how do they respond to future customer needs or environmental challenges?

What role does sustainability play in your vision of a future fashion store?

In what ways might future fashion stores help reduce waste or encourage more responsible consumer behaviour?

TEACHER'S NOTES

Encourage students to explore the future of fashion retail by combining creativity with technological and environmental awareness.

Students may work alone or in teams (recommended: 2–4 students per team).

Encourage each group to take a different angle (e.g. eco-focused store, high-tech store, local slow fashion store).

RESOURCES

Smart Draw Software
https://www.smartdraw.com/planogram/store-layout-maker.htm?srsltid=AfmBOoquWIyTm-0Y1zqromLoauVj4G94LpsLitQIXndjGhpHfujJihQF

ArredoCAD
https://arredocad.com/en/interior-design/showroom

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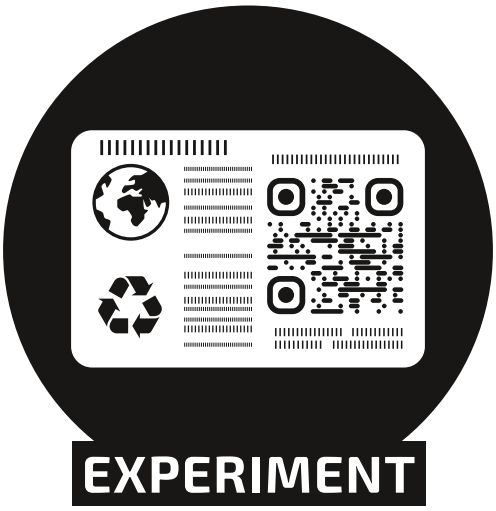
#20

PHASE 8

RETAIL & CONSUMER USE

DISTRIBUTION, MARKETING, AND CONSUMER PURCHASING, INCLUDING THE USAGE AND MAINTENANCE (WASHING, DRYING) OF TEXTILES.



TRACEABILITY OF CLOTHING

USE OF FINISHED CLOTHING

Students explore how modern technologies such as QR codes, RFID tags, apps, and websites are used to track the supply chain of fashion products and increase transparency. They select clothing items, examine labels and packaging, use technology to research supply chain information, compare transparency levels across brands, and discuss their findings.

90 Minutes

- + **Various clothing items with QR codes, RFID tags, or other digital tracking elements**
- + **Smartphones or tablets with internet access**
- + **Apps or websites for product and supply chain tracking**
- + **Notebooks or digital documents for recording findings**
- + **Projector or large screen for group sharing (optional)**

LEARNING OUTCOMES

Students are able to:

understand how digital technologies are used to track supply chains in the fashion industry.

Develop critical analysis skills to assess brand transparency.

gain experience in researching and comparing information from different digital sources.

build awareness of sustainability and ethical issues in fashion production.

STEPS

1. Introduction to QR codes, RFID tags, tracking apps, and their applications in the fashion industry
2. Selection of clothing items and initial examination of labels and packaging
3. Use of smartphones or tablets to scan QR codes, read RFID tags, or access websites for supply chain details
4. Documentation of origin and production steps for each item
5. Comparison of brand transparency using set criteria (e.g., number of disclosed production steps, geographic information, sustainability data)
6. Group or class discussion of results
7. Reflection on the role of transparency in consumer decision-making

QUESTIONS FOR REFLEXION

Which technologies were most effective for tracking?

Which brands appeared most transparent and why?

Where were there gaps in the available information, and what might explain this?

How does this information affect your attitude towards fashion and consumption?

What steps could companies take to improve supply chain transparency?

TEACHER'S NOTES

Check in advance that the selected clothing items have some form of digital tracking element

Prepare alternative resources (e.g., brand websites, sample QR codes) in case some items lack data

Encourage constructive critique rather than brand shaming — the goal is to evaluate transparency, not to attack brands

Support the discussion with examples of sustainability and human rights issues in fashion

RESOURCES

Sustainability Rankings
https://goodonyou.eco

Brand directory with ratings
https://directory.goodonyou.eco

Clear Fashion (Transparency Information & Eco-Labels)
https://en.clear-fashion.com

Fashion Transparency Index (by Fashion Revolution)
https://www.fashionrevolution.org/fashion-transparency-index

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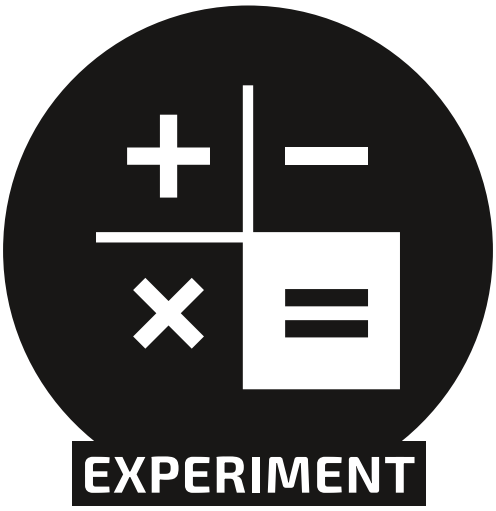
#21

TEXTILE SUPPLY CHAIN

PHASE 8

RETAIL & CONSUMER USE

DISTRIBUTION, MARKETING, AND CONSUMER PURCHASING, INCLUDING THE USAGE AND MAINTENANCE (WASHING, DRYING) OF TEXTILES.



THE MATHS BEHIND CLOTHING SIZES

At first glance, fashion and mathematics might seem like two separate worlds—one driven by creativity, the other by calculation. But in reality, they are deeply connected. Behind every garment lies a series of precise mathematical steps that ensure the final product is functional, well-fitting, and economically viable. From sketching with geometric proportions to measuring body dimensions, calculating fabric needs, setting prices, managing inventory, and estimating return on investment—mathematics is woven into every phase of the fashion process.

In this activity, students explore one essential question: How are standard clothing sizes created and calculated?

120 Minutes

- Desks and chairs
- A projector
- A computer for the teacher
- A physical/digital board; Internet connection for all participants
- A paper or virtual space for writing notes and drawing sketches for students

LEARNING OUTCOMES

Students are able to:

explain how mathematical principles such as measurement, proportion, and geometry are applied in the design and production of garments.

identify the process behind the creation of standard garment sizes and understand how body measurements are translated into sizing systems.

understand the role of accurate data in ensuring fit, function, and production efficiency in the fashion industry.

STEPS

1. Start by showing the YouTube video "If the shoe fits - A maths story about non-standard Measurement" (7min) If necessary, activate the automatic subtitles in your language
2. Comment the video briefly and the topic of maths behind textile production
3. Introduce the tool "Size Breakdown Sheet"
4. Conduct a practical session on how to create a SBS with the students
5. Create a final moment of discussion and reflection on sizing (30min) If you like, have a look also at the "body scanning tool" that you can find in the resources section

QUESTIONS FOR REFLEXION

How is the topic of sizing related to inclusion and diversity?

In which steps of the clothing design or production process did you notice the most use of mathematics?

What challenges can arise from using fixed sizing systems for diverse body types?

TEACHER'S NOTES

Highlight the central idea: mathematics is deeply embedded in fashion, particularly in sizing systems, pattern-making, fit, and production.

Support students by the calculation of their measurements and analysis of their measure whether they fit (or don't fit) into standard sizes.

Ensure that all students feel comfortable and no one is pressured to be measured if they prefer not to

RESOURCES

If the shoe fits - A maths story about non-standard Measurement
https://www.youtube.com/watch?v=XsLz-icSu5g

Body Scanning
https://www.me-you-us.education/you-body-scanning

Fashion Designers- how do they use math?
https://www.mathnasium.com/math-centers/hydepark/news/fashion-designers-how-do-they-use-math-hp

What is the size breakdown sheet?
https://techpacker.com/blog/design/what-is-a-size-breakdown-sheet-and-how-to-create-one/#google_vignette

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#22

TEXTILE SUPPLY CHAIN

PHASE 8

RETAIL & CONSUMER USE

DISTRIBUTION, MARKETING, AND CONSUMER PURCHASING, INCLUDING THE USAGE AND MAINTENANCE (WASHING, DRYING) OF TEXTILES.

PH TEST FOR DYED FABRICS

Students will investigate how fabric dyes can react to different pH levels by using red cabbage juice as a natural pH indicator. They will dye cotton fabric samples with red cabbage juice, then apply acidic (vinegar) and basic (baking soda) solutions to observe color changes. This experiment connects dye chemistry with environmental factors affecting colorfastness and fabric appearance.

60–90 Minutes

20–30 MINUTES Preparation and dyeing

20–30 MINUTES Application of solutions and observation

15–30 MINUTES Discussion and analysis

- Fresh red cabbage or bottled red cabbage juice
- Small cotton fabric squares or strips (pre-washed and dry)
- Vinegar (white or apple cider vinegar)
- Baking soda (sodium bicarbonate)
- Water

- Spray bottles or droppers
- Bowls or containers for soaking fabric
- Gloves (optional)
- Paper towels or drying rack
- Notebook or worksheet for recording observations
- Magnifying glass or smartphone camera (optional, for close-up observation)

LEARNING OUTCOMES

The student is able to:

Explain how natural dyes like red cabbage juice act as pH indicators.

Demonstrate the effect of acidic and basic substances on dyed fabric colors.

Observe and document color changes related to pH variations.

Understand the relationship between pH and colorfastness in textiles.

STEPS

1. Chop fresh red cabbage and boil it in water for 15–20 minutes to extract the juice. Let it cool and strain out solids.
2. Soak cotton fabric pieces in the cooled cabbage juice for 15–20 minutes to dye them a purplish color. Remove and dry slightly.
3. Prepare three sample groups for each dyed fabric:
   - Apply vinegar (acidic) to some areas using a spray bottle or dropper.
   - Apply baking soda solution (basic) to other areas.
   - Leave some areas untreated as a control.
4. Observe and record the color changes on the fabric samples over time.
5. Discuss how the pH levels cause the cabbage dye to change color (e.g., acidic solutions turn red/pink, basic solutions turn green/blue).
6. Reflect on implications for dye chemistry and textile care.

QUESTIONS FOR REFLEXION

What color changes did you observe when applying vinegar and baking soda?

Why do natural dyes like cabbage juice change color with pH?

How might pH affect the colorfastness of dyed textiles in real life?

What environmental factors could influence fabric pH and dye stability?

TEACHER'S NOTES

Prepare cabbage juice in advance if time is limited.

Use gloves to protect hands from staining or irritation.

Ensure good ventilation if using vinegar.

Remind students to label fabric samples clearly.

Encourage detailed note-taking and photo documentation.

Connect the experiment to broader topics like
sustainable textile dyeing and environmental impacts.

RESOURCES

Red cabbage pH indicator tutorial
https://www.science-sparks.com/red-cabbage-pH-indicator

Video: “Using Red Cabbage as a pH Indicator”
https://www.youtube.com/watch?v=0c70L8z9N7E

Natural dyes and pH effects
https://www.naturaldyes.co.uk/natural-dyes/pH

Textile dyeing and colorfastness basics
https://textilelearner.blogspot.com/2015/10/colorfastness-in-textile.html

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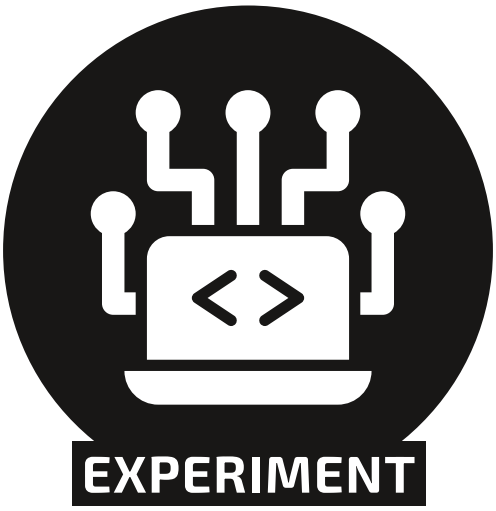
#23

TEXTILE SUPPLY CHAIN

CROSS-CUTTING



SOFTWARES FOR FASHION

As the fashion industry increasingly shifts toward digital workflows, software has become an essential tool in textile and garment creation. From digital fabric simulation to pattern drafting, colour mapping, and virtual fittings, various programs support different stages of the design and production process. These tools are often grouped by function—such as 2D pattern-making, 3D garment simulation, or textile surface design.

In this activity, students explore the digital side of fashion by investigating the landscape of textile design software. They compare different tools, examine which are most commonly used in the industry, and evaluate their accessibility. Then, they dive deeper into one specific program to understand its features and experiment with it creatively.

90 Minutes

+ Desks and chairs
+ A projector
+ A computer for the teacher
+ A computer or table for each student
+ Internet connection for all students

LEARNING OUTCOMES

Students are able to:

describe digital tools supporting the fashion industry.

use a new digital tool.

draft a personal small project.

STEPS

1. Introduction to the topic of digital softwares for fashion.
2. Presentation of the software to be explored during the activity.
3. Familiarisation with the tool by the students individually and Q&A.
4. Provision and development of the task to be completed by the students.
5. Finally, all students briefly display their work in plenary.

QUESTIONS FOR REFLEXION

What are the benefits and risks associated with the use (and over-use) of digital software?

How does digital software improve efficiency, accuracy, or creativity in the fashion design process?

How can we find a balance between using digital tools for innovation and maintaining human creativity and control?

TEACHER'S NOTES

Encourage students to reflect not only on what the software can do but also on its limitations, such as cost, learning curve, loss of manual skill, or environmental impact of digital infrastructure.

Foster discussion around the balance between technological innovation and human creativity, especially in fashion where both play a vital role in meaningful and sustainable design.

RESOURCES

CLO Design Software
https://www.clo3d.com/en

Style 3D Design Software
https://www.style3d.com

SYNC Design Software
https://www.isyncsolutions.com

ME-YOU-US
https://www.me-you-us.education

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#24

TEXTILE SUPPLY CHAIN

PHASE 8

RETAIL & CONSUMER USE

DISTRIBUTION, MARKETING, AND CONSUMER PURCHASING, INCLUDING THE USAGE AND MAINTENANCE (WASHING, DRYING) OF TEXTILES.

TRACEABILITY OF CLOTHING

USE OF FINISHED CLOTHING

Students will explore the relationship between the fashion industry and media, focusing on the concepts of fashion literacy and fashion media literacy. They will investigate how media shapes fashion trends, consumer perceptions, and industry practices. Additionally, students will learn about the digital skills required in modern garment production and the roles of digital specialists supporting tailors and designers. This experiment encourages critical thinking about media influence and highlights the importance of digital competencies in fashion careers.

~90–120 Minutes

- **Access to internet-enabled devices (computers, tablets, smartphones)**
- **Projector or screen for group presentations**
- **Worksheets or digital documents for note-taking and activities**
- **Examples of fashion media content (magazines, social media posts, advertisements, videos)**
- **Links to interviews or documentaries about fashion and media**
- **Presentation tools (PowerPoint, Google Slides, or similar)**
- **Optional: guest speaker (digital fashion expert or media specialist)**

LEARNING OUTCOMES

The student is able to:

Define fashion literacy and fashion media literacy and explain their importance.

Analyze how media influences fashion trends and consumer behavior.

Identify key digital skills needed for modern garment production.

Recognize the roles of digital specialists (e.g., CAD designers, 3D modelers, digital marketers) in supporting tailors and designers.

STEPS

1. Introduce key concepts:
   - Fashion literacy – understanding fashion history, design, and cultural context.
   - Fashion media literacy – critically analyzing fashion content in media and its influence.
2. Present examples of fashion media (ads, social media, magazines). Discuss how these shape trends and consumer views.
3. Assign students to small groups.
   Each group researches:
   - The digital skills required in fashion production (e.g., CAD, 3D modeling, digital pattern making, social media management).
   - The types of digital specialists who collaborate with fashion professionals.
4. Groups prepare a short presentation or infographic summarizing their findings.
5. Groups present to the class. Facilitate a discussion on the role of media and digital technology in shaping fashion today.
6. Reflect on how students personally interact with fashion media and digital tools.

QUESTIONS FOR REFLEXION

What does it mean to be fashion literate in today's digital world?

How does fashion media influence what we wear and how we perceive style?

Which digital skills do you think are most important for future fashion professionals? Why?

How do digital specialists help designers and tailors create modern garments?

Can media sometimes misrepresent fashion or create unrealistic standards? How can we critically engage with this?

How might increased media literacy benefit consumers and creators in fashion?

TEACHER'S NOTES

Prepare diverse media examples to engage students with different interests.

Encourage critical thinking and open discussion, highlighting media's positive and negative effects.

Adapt digital skills research based on students' age and background knowledge.

Invite a digital fashion expert or show interviews for real-world insights if possible.

Use collaborative tools (Google Docs, Padlet) for group work and presentations.

Connect this lesson to sustainability and ethical issues in fashion media where appropriate.

RESOURCES

Fashion literacy explained
https://www.vogue.com/article/what-is-fashion-literacy

Fashion media literacy basics
https://medialiteracynow.org/what-is-media-literacy

Digital skills in fashion production
https://fashionunited.uk/news/fashion/these-are-the-most-in-demand-digital-fashion-skills/2021030952277

Roles of digital specialists in fashion
https://www.digitalfashion.blog/digital-fashion-jobs

Video: “How Media Influences Fashion”
https://www.youtube.com/watch?v=w7S7z3oZnDk

TED Talk on media literacy
https://www.ted.com/talks/clare_mallett_media_literacy_and_you

CAREER GUIDANCE: STEM IS IN VOGUE

Promoting sustainability in the textile and fashion industry through STEM careers.

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PROJECT PARTNERS

CorEdu, Germany

Eurocultura, Italy

GoSpark , Slovenia

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#25

TEXTILE SUPPLY CHAIN

PHASE 8

RETAIL & CONSUMER USE

DISTRIBUTION, MARKETING, AND CONSUMER PURCHASING, INCLUDING THE USAGE AND MAINTENANCE (WASHING, DRYING) OF TEXTILES.

DETECTING MICROFIBERS IN WASHING WATER

Students will explore the environmental impact of washing textiles by detecting microfibers released into the water. They will wash samples of different fabric types, filter the wastewater through coffee filters, and use magnifiers to observe and compare microfiber shedding. This hands-on experiment helps students understand pollution caused by synthetic fabrics and the importance of sustainable textile choices.

~60 Minutes

- Small fabric samples (natural fibers like cotton and synthetic fibers like polyester)
- Water

- Bowls or buckets for washing
- Mild detergent (optional)
- Coffee filters or fine mesh filters
- Funnels or filter holders (optional)
- Magnifying glasses or microscopes
- Tweezers
- Plastic trays or white paper for placing filters
- Gloves (optional)
- Notebook or worksheet for observations
- Camera or smartphone (optional, for photo documentation)

LEARNING OUTCOMES

The student is able to:

Describe what microfibers are and how they are released during textile washing.

Conduct a simple experiment to detect microfibers in washing water.

Compare microfiber shedding between different fabric types.

Understand the environmental consequences of microfiber pollution.

Reflect on sustainable textile choices and practices to reduce pollution.

STEPS

1. Prepare fabric samples of similar size from natural and synthetic fibers.
2. Fill bowls with water (and optional mild detergent) and wash each fabric sample by hand for a few minutes.
3. Collect the washing water and pour it through a coffee filter placed in a funnel or held over a clean container.
4. Carefully remove the filter and place it on a white surface or plastic tray.
5. Use magnifying glasses or microscopes to observe and count microfibers trapped on the filter.
6. Record observations, noting differences between fabric types.
7. Discuss the results and implications for environmental pollution and textile sustainability.

QUESTIONS FOR REFLEXION

Which fabric type released more microfibers? Why might that be?

How do microfibers contribute to water pollution?

What impact does microfiber pollution have on ecosystems and human health?

How can consumers reduce microfiber release from their laundry?

What role do textile manufacturers have in addressing microfiber pollution?

How does this experiment change your perspective on fabric choices and care?

TEACHER'S NOTES

Prepare fabric samples and materials in advance for smooth workflow.

Use gloves if preferred, especially when handling detergents.

Remind students to be gentle when handling filters to avoid losing trapped microfibers.

Encourage students to take photos to document findings.

Supplement the activity with videos or articles on microfiber pollution for deeper understanding.

Connect this experiment to broader topics on sustainable fashion and environmental responsibility.

RESOURCES

Microfiber pollution explained
https://www.nrdc.org/stories/microfiber-pollution

Simple microfiber washing experiment
https://www.instructables.com/Detecting-Microfibers-in-Washing-Water

Video: “How Microfibers Pollute Our Oceans”
https://www.youtube.com/watch?v=VZudjU4nkto

Sustainable laundry tips to reduce microfiber pollution
https://www.syntheticleather.org/microfiber-pollution-guide

Scientific article on microfiber release
https://www.sciencedirect.com/science/article/pii/S0048969719356344

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#26

TEXTILE SUPPLY CHAIN

PHASE 9

RECYCLING & WASTE MANAGEMENT

REUSING, UPCYCLING, OR RECYCLING TEXTILES TO MINIMIZE WASTE AND PROMOTE CIRCULAR ECONOMY PRACTICES.

RECYCLING FABRIC WASTE INTO PAPER

Recycling fabric waste into paper is a creative and sustainable way to reduce textile waste and give discarded materials a new purpose. In the textile and fashion industry, large amounts of fabric scraps are produced, much of which ends up in landfills. By transforming these scraps into paper, students learn how recycling can conserve resources, reduce environmental impact, and promote circular thinking. This process also shows how fibres—whether from plants or textiles—can be reused to create functional new materials.

90 Minutes

- Clean fabric scraps (preferably natural fibers like cotton or linen; avoid synthetic blends)
- Water

- Scissors (to cut fabric into small pieces)
- Blender (for pulping the fabric with water)
- Large bowl or tub (for mixing and soaking the pulp)
- Mesh screen or paper-making frame (deckle and mould)
- (DIY option: old picture frame with mesh or netting stapled to it)
- Sponge (for pressing out excess water)
- Absorbent cloths, felt, or towels (for drying the paper)
- Rolling pin (optional, for pressing and flattening)
- Measuring cup (optional, for consistency in pulp-to-water ratios)

LEARNING OUTCOMES

Students are able to:

measure and compare textile surface dimensions before and after smocking, using basic mathematical calculations to determine the percentage of surface reduction.

understand how the mechanical manipulation of inelastic fibres through hand techniques can create functional properties such as elasticity.

apply systematic procedures (marking, stitching, gathering, fixing) to create a repeatable textile modification and evaluate its practical and decorative effects.

STEPS

1. Cut clean cotton or linen fabric into small pieces, approximately 1–2 cm in size.
2. Place the fabric pieces in a bowl of warm water and let them soak for several hours or overnight to soften the fibres.
3. Transfer the soaked fabric and a small amount of water into a blender. Blend in short pulses until the mixture forms a smooth, fibrous pulp. Add more water if needed for easier blending.
4. Position a mesh screen or paper-making frame over a large tub or sink. Pour the pulp evenly onto the screen, spreading it out into a thin, uniform layer.
5. Allow the water to drain through the mesh. Use a sponge to gently press down on the pulp to remove excess water and flatten the surface.
6. Carefully flip the screen onto a piece of felt, towel, or cloth. Gently lift the screen away, leaving the wet pulp layer on the fabric.
7. Let the paper air dry for one to two days. Alternatively, speed up drying with a fan or by placing it in a warm, dry space. Make sure the sheet lies flat while drying to avoid curling.
8. Once completely dry, peel the paper off the cloth. If desired, trim the edges or press it flat using a heavy book or rolling pin for a smoother finish.

QUESTIONS FOR REFLEXION

What did you notice about the transformation of fabric into pulp and then into paper?

How did the type or condition of the fabric scraps affect the final result?

What challenges did you face during the process, and how did you solve them?

Why do you think recycling fabric waste into paper is important for the environment?

In what other ways could fabric waste be reused or given a new purpose?

TEACHER'S NOTES

Start with a brief discussion about textile waste and its environmental impact.

Pre-cut cotton or linen fabric scraps. Avoid using blended or synthetic fibres, as they don't break down as easily.

Supervise the use of blenders carefully.

Show what finished pulp and dry paper should look like to guide expectations.

Let students experiment with adding dried flowers, coloured fibres, or threads to personalise their paper.

Soak the fabric scraps overnight before class if time is limited.

RESOURCES

How to make paper from fabric scraps - demonstration
https://www.youtube.com/watch?v=HCZht89Vawc

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TEXTILE SUPPLY CHAIN

PHASE 9

RECYCLING & WASTE MANAGEMENT

REUSING, UPCYCLING, OR RECYCLING TEXTILES TO MINIMIZE WASTE AND PROMOTE CIRCULAR ECONOMY PRACTICES.

MAKING A SHOPPING BAG FROM FABRIC SCARPS

WOWEN SHOPPER

The textile industry produces enormous amounts of waste—offcuts, leftover materials, and unsold clothing often end up in landfills or are incinerated. A major challenge is that many of these materials are still usable but are discarded because they no longer fit into mass production systems. At the same time, producing new textiles requires large quantities of water, energy, and chemicals, contributing to pollution and resource depletion.

This experiment addresses that problem: instead of throwing fabric scraps away, students find a way to reuse them. By weaving a bag from these discarded materials, students explore how waste can be transformed into something useful—offering an alternative to disposable culture and showing how design can be part of the solution.

180 Minutes

- Fabric scraps (sturdy materials like old jeans, curtains, or cotton work best)
- Handles (can be made from fabric strips, old belts, or thick ribbon)
- Scissors or fabric shears

- Measuring tape or ruler
- Pins or fabric clips
- Sewing thread
- Sewing needles (for hand sewing) or sewing machines (optional, if available)
- Chalk or fabric marker (for marking cutting lines)
- Iron and ironing board (optional but helpful for neat seams)
- Templates or simple bag patterns (optional, for guidance)

LEARNING OUTCOMES

Students are able to:

apply measurement and spatial reasoning skills to accurately cut fabric pieces and assemble them into a functional structure.

follow a step-by-step construction process using sewing techniques to build a stable, load-bearing textile product.

understand how the properties of different fabrics (e.g. strength, thickness, flexibility) affect the function and durability of a textile product.

STEPS

1. Choose sturdy fabric scraps suitable for carrying weight. Iron the fabric if it's wrinkled, and cut away any damaged or unusable sections.
2. Measure and cut two equal rectangles for the main part of the bag (e.g. 40 × 45 cm).
3. Cut two long strips (e.g. 50 × 6 cm) to use as handles.
4. Place the two main fabric rectangles together with the right sides facing in.
5. Pin or clip the edges to hold them in position.
6. Using a straight stitch, sew along both sides and the bottom of the fabric. Leave the top edge open.
7. Backstitch at the beginning and end for added strength.
8. Fold each fabric strip in half lengthwise. Then fold the raw edges inward toward the center fold.
9. Sew along the open edge to secure the fold and form a sturdy handle.
10. Turn the bag right side out.
11. Pin the handles evenly to the top edge of the bag, either on the inside or outside.
12. Sew them securely in place.
13. Double-stitch the handles for added durability.
14. Optionally, hem the top edge of the bag for a clean and neat finish.
15. Test your finished bag by placing light items inside.
16. Reflect on the functionality and durability of the bag, and discuss how reusing fabric helps reduce textile waste.

QUESTIONS FOR REFLEXION

What challenges did you face while cutting, sewing, or assembling the bag, and how did you solve them?

How well did your finished bag hold up during the test? What would you improve in your design or technique?

Why is it important to reuse fabric instead of throwing it away?

In what ways does making a bag from fabric scraps help reduce textile waste and environmental impact?

How could this idea be expanded or adapted for other textile products in daily life?

TEACHER'S NOTES

Begin with a short discussion about textile waste and its environmental impact.

Emphasise the relevance of practical sewing skills in everyday life and sustainable thinking.

Adapt steps depending on students' sewing experience. Offer machine or hand-sewing options.

Stress the importance of measuring and aligning fabric accurately to avoid uneven or unbalanced results.

Show how to secure stitches properly (e.g. backstitching) and how to reinforce handles for functionality.

RESOURCES

How to make paper from fabric scraps - demonstration
https://www.youtube.com/watch?v=HCZht89Vawc

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