BAA STOOL

SELF-DIRECTED PROJECT

Maddie Calthrop

A reimagined approach to using felt in upholstery for a more sustainable outcome.

CONTEXT

BRIEF

The **circulation of furniture** reflects the concept of considering the design, manufacturing and **lifespan** of furniture as one while **minimising waste** and negative **environmental impact**. The aim is to create a route where furniture can be easily **reused, repaired and recycled** rather than being sent to landfill or incinerated.

Consider the following key driving factors. The difficulty of recycling furniture, the fabric waste involved in the upholstery process, and the environmental **benefits of using locally sourced wool (British wool)**.

Design a piece of furniture or product that uses **3D felting** to **reduce fabric waste** and is highly recyclable. This item should carefully consider all aspects of suitably designed and have an overall improvement on the circularity of upholstery.

Week 1

- Source some wool
  - Where can you get a Wool fleece
  - price / expence.
  - British wool Board

Proces Reaseah

- How to clean fleece
  - → Water + soap
  - → drying
  - → Lamatins
- Combing / cording

Reasher Industy

Testing if time

Week 1 outcombe

- Wool + cading brush ordered.
- reashe on diffrent sheep and Wool types done
- Understand how to proces and clean wool.

Week 2

Aims: TESTING

- proccess and clean my Wool and document.
- do wet felting tests.
  - ↳ 3D felt — soft forms — Hard form
  - ↳ tying / detai testing

start sketch / ideation

- desing influenced by felt testing

OutCOME:

- Wool cleaned + dryed - some issues with drying
  - ↳ Not fully clean.
  - ↳ tested wet fel + kneed
- attempted Wet — too fragele
  - 3D kneded better — explore forms

Week 3

Aims: Ideation / testing.

Contine testing and start sketting inspied by the Limits of testing

- test Fom with Concaved forms.
- Washing Mashine test — skrinkage
- lacing and draw string test

OUTCOME:

- Concaved form Work well Need to be Thick.
- Washing Mashine break down the shape — dosnt help felt.
- draw string work best that go start in to felt
- sketching show stool direction

Week 4

Aims: lost of Sketch Refine the stool idees and possiball details

- ↳ reparia billity aspect → built in Mending tool.

— Creat a CAD shape to start testing felting on Large scale.

- look in to Natural dying
- plan what to do over easter

OUTCOME:

- felting on large scale
- softer ony shape
  - ↳ stool top need to be exsajerated
- Direction → Simple Milk Maid stool
  - ↳ built in tool need refining → felt cover.

EASTER

Aims: do a lot of process DOC
Catch up on uploding images
Edit / Analys photo of testess

- Edit sketches Cscat FINAL sketches for direction
- have plan for after easter

Week 5

Aims:

- start Modeling full scale STOOL
- Using CAD to further refine
- top stoo shape / refine.
- Reashare in to Natural dying of Wool

outcome

- stool top need to have more curved edges.
- Further & Refined stoo dimentia
- Order Dying ALUM - try dying some testers.

Week 6

Aims:

- test out dying of Natral matirials
- ~~Finalise~~ Finalise desing Through testing of legs + seat.
- start Manufatoring.

outcome.

- 3 possible dyes yellow / orange / pink
- legs are 35mm → screw / hole part of leg being Made.
- Need to test Making Mending tool

Week 7

Aims: More dying with blue / purple
Red cabage?
: Finish Making legs - have Madeline turn legs
· Creat mending tool.

Week 7.5

- Poccess doc uptodate
- Repairibility?
- start felting top cover

out come

- dying Onion skins — Green / brown → Very Ugly.
- legs turned From Pine — Find outcome Would be diffrat Wood.
- Mending too created. out of metale
  - ↳ Pine too soft. → Find hard wood

Reflection → lots of Thing I Would do diffrent

- dowl Mushroom
- leg joins.
- Matirial

Week 8 : Final WEEk

Aims: Finish Felt cover + dying
: stool prototype — Pine + MDF
: Final photos — In situe — + SALE — outside

Monday 19th

ALL done — Dye yellow
Few issues

photo outside + In Newton
At take / sitting on
↳ And IN tomorrow.

TYPES OF BRITISH WOOL

The type of fleece used in felting can greatly impact the final result. The UK boasts over 60 sheep breeds, contributing to a variety of wool types. Wool quality is measured in "micron," which indicates fibre thickness; a lower micron count generally signifies higher quality. British wool typically ranges from 29 to 35 microns and can be divided into seven groups based on the wool type produced.

Naturally coloured

Sheep that naturally produce coloured fleece vary in micron value depending on the breed. Naturally coloured breeds include Jacob and Black Welsh Mountain.

Figure 1, Black Welsh Mountain sheep

Mountain

These sheep are adapted to live in harsh environments, which is why they produce thick fleece with coarse fibres to protect them. Fleece is typically 35 microns and above and is commonly used in carpet and insulation manufacturing. This includes sheep such as the Blackface, which live in the Scottish Highlands.

Figure 2, Lanark Blackface sheep

Fine

This wool comes from Downland sheep, which produce thick, fluffy coats made up of more consistent fibre types. This uniformity makes processing and dyeing easier. Fine wool is typically used in bedding and knitted garments. Breeds of Downland sheep include the Clun Forest and Southdown.

Figure 3, Clun Forest sheep

Hill

Hill wool is finer than mountain breeds but still has long fibre lengths and is resistant to wear and tear. Their wool is more typically used for upholstery and blankets for tough resistance fabrics; breeds include the Kerry Hill.

Figure 4, Kerry Hill sheep

Medium

Medium wool is the most versatile type of wool. It can be easily dyed and processed. It is both hard-wearing and has a low micron count, making it ideally suited for clothing, fabrics, and carpets. Breeds such as the British Mule sheep and the Devon Closewool both produce medium fleeces.

Figure 5, Gimmer lambs

PROCESSING WOOL

Skirting

This initial step involves inspecting the fleece and removing undesirable parts. Skirting describes cutting away stained, coarse, or contaminated edges, ensuring that only the best quality wool is processed further.

Figure 6, Skirting fibers

Washing

After skirting, the fleece is washed to remove grease (lanolin), dirt, and contaminants. This is typically done with warm water and a mild detergent, allowing the wool to soak to effectively dissolve impurities without felting the fibers.

Figure 7, Washing sheeps wool

Drying

Once washed, the fleece must be thoroughly dried. This can be done by laying it flat or hanging it in a well-ventilated area. Proper drying is essential to prevent mildew and ensure the wool is in good condition for further processing.

Figure 8, Drying fibers

Carding and Combing

After drying, the wool is carded to separate and loosen the fibres. This involves passing the wool through combs or rollers to align the fibres. Combing may be followed to create long, parallel strands by removing short or tangled fibres, resulting in smoother, finer wool suitable for high-quality yarn.

Figure 9, Carding

WET FELTING

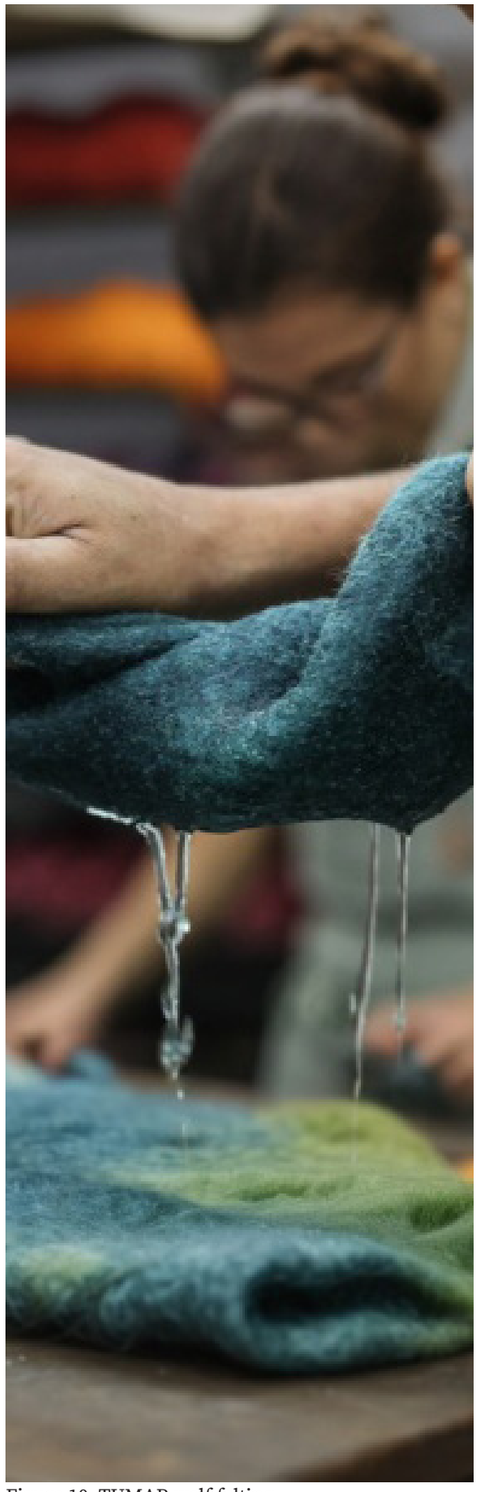


Figure 10, TUMAR welf felting

1. Card the Fibers:

Evenly card the fibres. Layer 4-5 layers of fibres on a piece of fabric, alternating directions (horizontal and vertical).

2. Soak the Fibers:

Carefully soak the fibres in hot water without disturbing their shape. Place thin fabric over the top and gently rub soap onto the fibres, adding more water as needed. Ensure they are wet but not soaking.

3. Roll the Felt:

Once the fibres start bonding, cover them with thicker fabric and roll them into a tube. Roll for 5-10 minutes, checking every few minutes to maintain shape. Use a hammer or rolling pin for further felting, turning it to cover all sides.

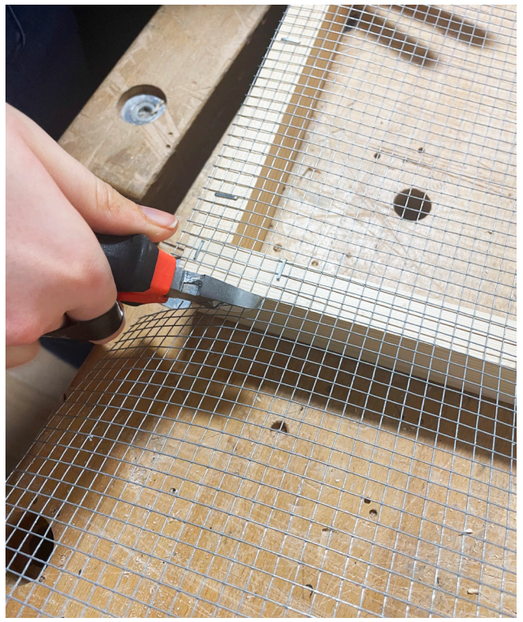
4. Final Felting:

When mostly felted, remove from the roll and use your hands to feel any loose areas. Continue adding water and soap to keep it wet.

5. Rinse and Shape

Once satisfied with the shape, rinse thoroughly with warm water until soap is gone. If needed, gently stretch or shape with more hot water. Finish with a final rinse in cold water and let it dry thoroughly.

PROCESSING MY WOOL



After researching the proper technique for cleaning wool, I processed a single sheep fleece. I began by removing large organic bits and hard matted areas. The fleece I purchased was quite dirty, requiring significant time to clean. I washed the wool three times using hot water and soap.

To dry it, I laid it out on a wooden frame covered in chicken wire, which helped with the drying stage. This part took the longest, as the wool retained a lot of moisture.

Overall, I learned that cleaning wool can be a lengthy process, but it could be improved with industrial methods, such as a larger cleaning setup or a drying room to expedite drying. I also discovered automated carding machines that can process more wool efficiently. After this effort, I ended up with several bean bags full of clean, processed fibers ready for wet and needle felting projects.

WET FELT TESTING

Having secured my materials and grasped the felting process, I started practising wet felting. My initial small samples turned out well, resulting in even, thick, and strong felt. However, I wanted to test if I could scale up my efforts.

I attempted a larger, double-sided sample using techniques I learned from videos and observing others. This proved challenging, as my specific fibres did not feel efficient and tended to fall apart. The outcome was a 3D pillow-shaped piece with noticeable inconsistencies—some areas were thick while others had holes. While this was my first attempt, I recognize the need to explore better methods for more effective 3D felting.

NEEDLE FELT TESTING

I started by using low-density foam for my felting project to see if I could begin bonding the fibres together with a single felting needle. However, I found that the low-density foam caused the fibres to feel into the foam itself. So, I looked for alternativefoamstouseasabaseforfelting.

I then switched to using high-density modelling foam, which worked much better and prevented the fibres from felting into the foam. I discovered that my fibres felted very well using needle felting, and I began to advance the felting technique by creating a 3d foam fold to use as a base shape.

Overall, needle felting worked considerably better and was more efficient than wet felting. I was able to create a thick yet consistent 3d form, and the fibres remained soft and comfortable.

Sample 1

3D half spheres - Felt can be felted in a 360-degree direction and retains its shape when removed from the mould. The thickness of the felt reduced the curves of the form.

Sample 2

Geometric square boxes - Instead of being made around a model, four felted squares are joined together to create the box. Felt can be more geometric shapes, but still have a softness to the overall form

FURTHER TESTING

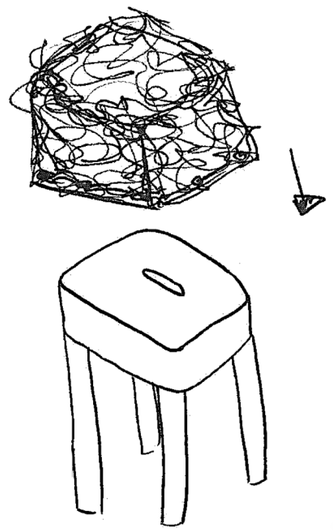
One of the main difficulties around not using adhesives in upholstery is upholstering around concave shapes. I need to conduct further testing to prove that 3D felting can be used to create concave shapes, and that the felt will retain its form without the need for adhesives or glues.

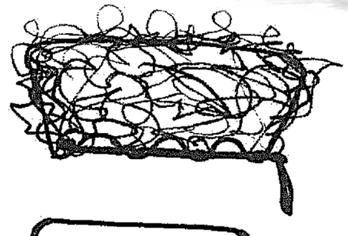
I created a concave form with curved edges, similar to those that might be found in seat bottoms that have an indentation. Initially, the felt would lose its shape when removed from the mould. Therefore, I continued to add fibre to make the form denser and thicker. This not only strengthened the concave shapes but also enhanced the comfort of the felt.

SKETCHING

Based on my findings, I have decided to use needle felting and demonstrate that it can be used in upholstery without the need for adhesives or permanent fixtures. My goal is to create a piece of furniture that showcases felt as the main feature.

With this aim in mind, I began sketching ideas for furniture that could feature a removable felt cover.





REPARABILITY

Repairability is crucial for extending the lifecycle of furniture, reducing waste, and promoting sustainability. Instead of discarding broken items, consumers can repair them, supporting a circular economy. **Effective strategies to enhance repairability include:**

Design for Disassembly - Furniture should be designed so that individual parts can be easily separated for repairs. Many designers are incorporating the concept of designing for disassembly, not only to improve recyclability but also to give consumers the opportunity to replace broken parts. An inspiring example is the MONK chair from 1990, which can be completely disassembled (Strantford 2025).

Figure 11, MONK chair

Access to Replacement Parts - Companies like Haworth provide easy access to replacement parts, facilitating repairs over replacements (Haworth 2025).

Figure 12, Haworth

DIY Repair Instructions - Clear guides, whether printed or online, can empower customers to make repairs themselves. Platforms like Instructables are pages where people share and document their DIY projects in the hope of helping others do the same (Anon. 2025).

Community Repair Workshops - Local repair cafes foster a repair culture, providing tools and expertise while strengthening community bonds.

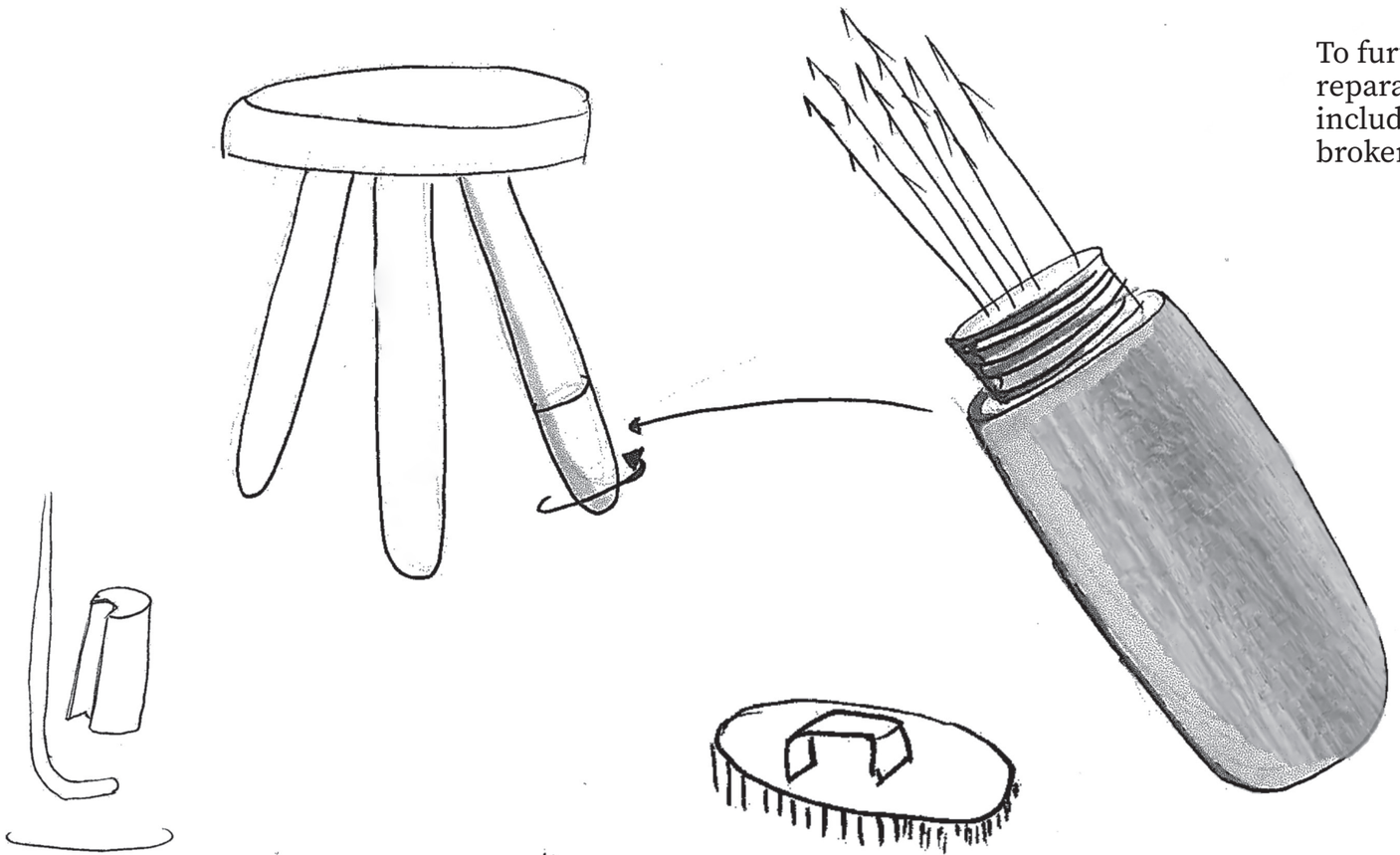
Figure 13, EVO by EFG

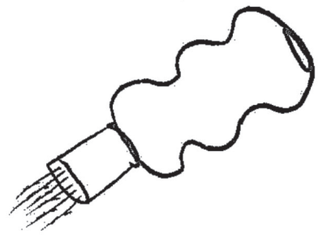
However, upholstery repairs pose challenges, often requiring specialised skills. While companies like Joybird offer custom services, promoting DIY resources for minor repairs, such as sewing seams or replacing buttons, can empower consumers further.

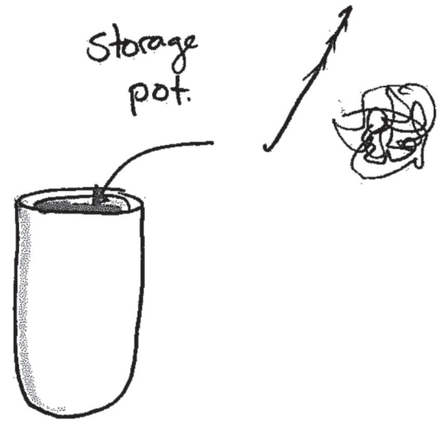
For my specific direction with felt, it can be easily repaired by adding more fibre on top of any tears. However, the average consumer may not have access to the felting tools needed. Therefore, I want to consider a way to include a storage solution in the stool that contains the necessary felting tools. If the cover is damaged, the consumer could remove it and repair it. This not only extends the product's life cycle but also adds a personal connection.

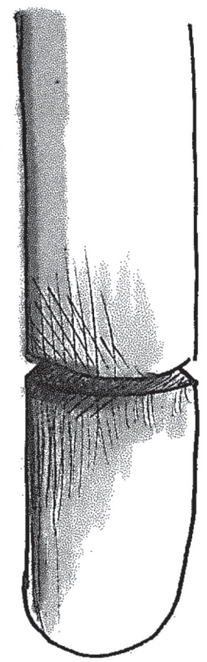
SKETCHING

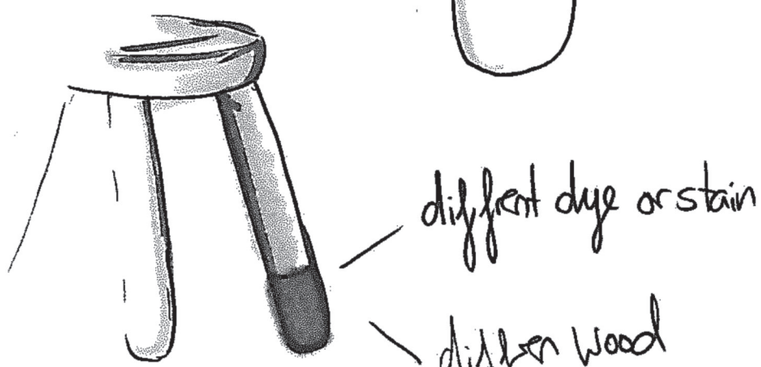
To further increase the lifespan of the furniture, I want to incorporate reparability into the stool's design. I started to sketch ideas for ways I could include a felting tool, allowing users to repair the surface if it ever becomes broken or damaged.

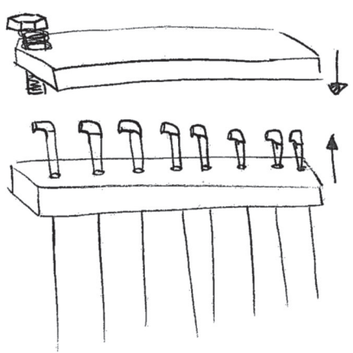


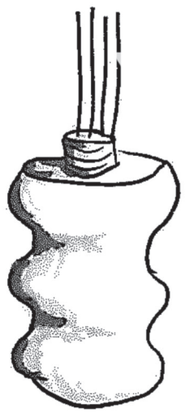












INITIAL IDEA REFLECTION

In my journey into needle felting, I have conducted extensive research that has expanded my understanding of its creative possibilities. This foundational work has guided my practical experiments with different techniques and materials, allowing me to learn about the unique properties of wool.

My initial design sketches are based on the outcomes of past tests, showcasing the potential of 3D needle felting in upholstery. I aim to demonstrate that felting can be a feasible alternative to traditional upholstery techniques.

Currently, I am focused on developing a wooden stool with a felt cover. The concave design of the stool illustrates how felt can form a three-dimensional shape without needing adhesives. This approach not only highlights design creativity but also simplifies recycling by avoiding non-recyclable materials.

The stool's removable cover serves multiple purposes. By using a drawstring for tension, I can reduce the need for staples, making recycling easier. Additionally, the cover can be cleaned, repaired, or swapped out without discarding the entire stool.

I want to incorporate a repairability aspect into the design, so I'm exploring ways to include a hidden storage area for a felting stool. This would allow the user to repaint the cover if it ever became damaged.

Moving forward, I plan to use model prototypes and CAD software to refine the stool's dimensions and structure. I aim to create a practical and sustainable stool. I also wish to explore colour options for the wood and investigate natural dyeing techniques to enhance the felt.

In summary, my early tests have significantly influenced my design direction, and I'm excited to further refine my ideas in the next stage of development.

MODEL 1

The first model was intended to provide a rough idea of the size and overall dimensions of a potential stool. It also gave me a better understanding of the radii of the seat and how that would affect the overall comfort of the stool.

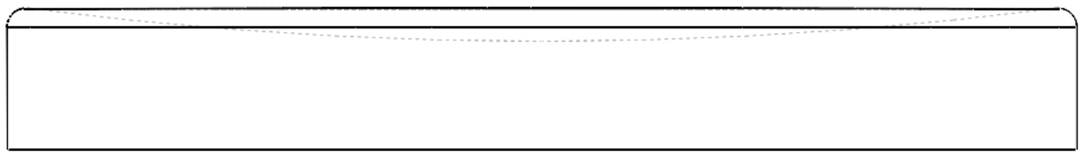
Needed Improvements:

Seat Size: The current seat width is 300mm, which is usable, but increasing it to 350mm would significantly improve comfort.

Seat Radius: The curvature of the seat dip is too gradual and not very perceptible, and when the felt cover is added, the seat appears flat. I plan to increase the radii to demonstrate that felt can conform to concave shapes.

Stool Height: The current height is too tall, which is partly due to the legs being set at too small an angle to the main seat. Stools are generally more comfortable when they are shorter than chairs, so I will reduce the overall seat height next time.

Seat Profile



Seat Thickness: The stool feels a bit disproportionate; the thickness of the stool does not match that of the legs. In the future, I want to make the stool seat 1.5 times thicker to create a better balance with the legs and make the seat more of a focal point.

Leg Design: I believe the square legs do not match well with the stool. Since the overall aim is for the felt cover to be more of the central focus of the design, I want to adopt a traditional, milkmaid-inspired stool design with round legs to better complement the stool top.

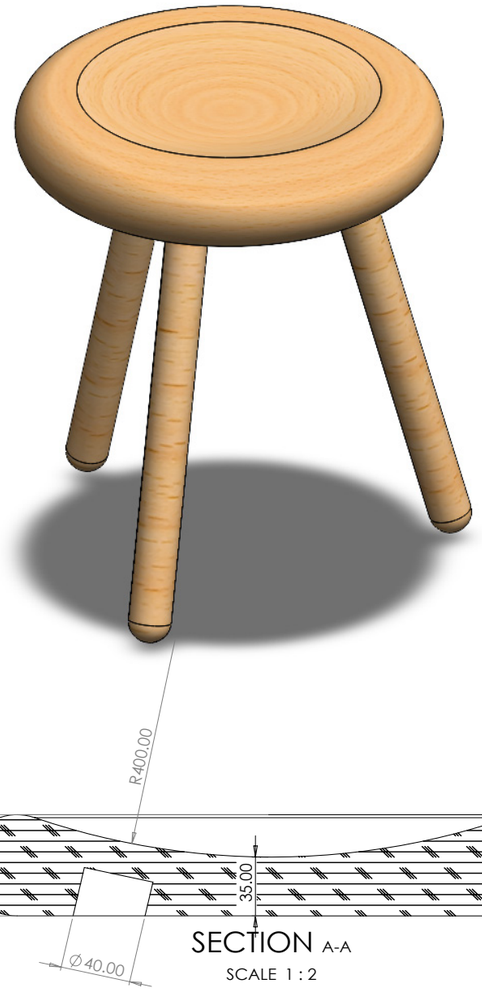
FIXTURES

I looked into more options for attaching the cover to the stool and further explored using drawing strings. This method has already been used in the past to create non-permanent upholstery covers.

I started by weaving felt strips through the edges of some of my prototypes. This acted as a drawstring, allowing me to pull it tight around the model. I was concerned that the felt at the edges might not be strong enough, so I also considered adding a type of bias binding to provide more support around the edges. Additionally, there was the possibility of adding eyelets to weave a drawstring through; however, the felt was strong enough on its own.

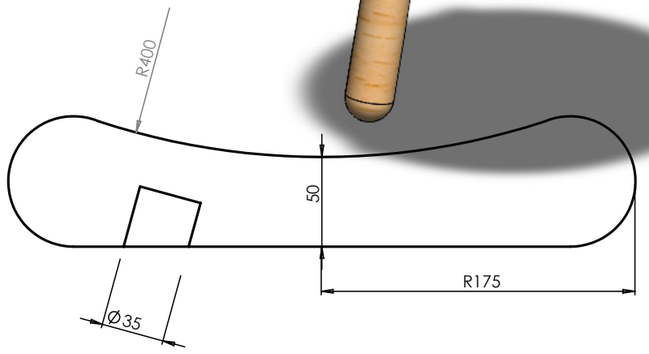
CAD MODELLING

Creating a curved model by hand was challenging due to the stool's seat shape, so I used CAD software for a digital model to better understand the proportions. I then made a foam prototype using CNC machining, which showed that the seat's radius was too gentle, causing a loss of definition with the cover. Despite this, the oval height and seat-to-leg proportions worked well, so I used these measurements for further modelling. I also began to explore how the legs would look if made from a different type of wood.

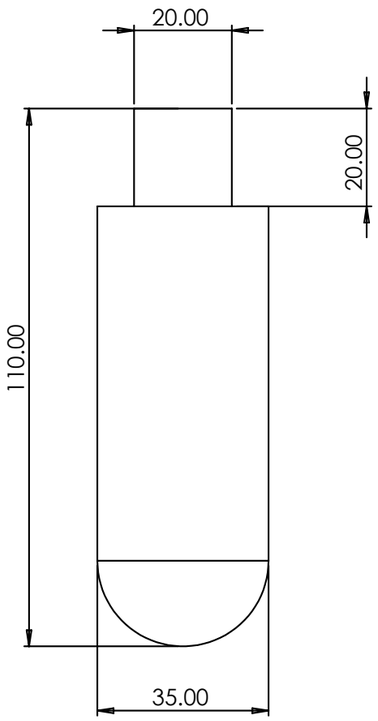


In the second CAD model, I exaggerated the radius of the seat and extended the radius of the edges so that the top and bottom are connected by smooth curves. This ensures that the seat cover maintains the intended curve. However, the radius at the ends of the seat is overly large, making the overall seat width exceed 80mm. As a result, the dimensions of the seat and legs are disproportionate to one another.

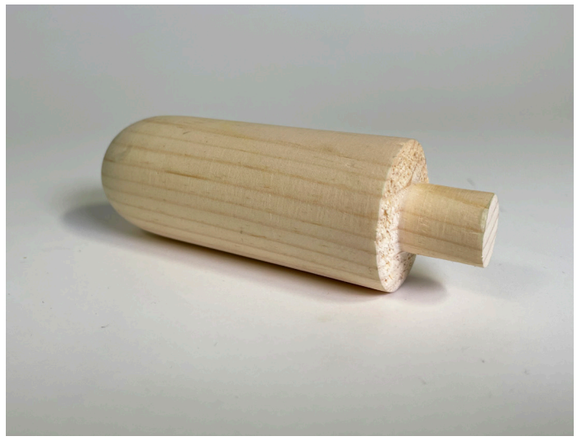
The third model aimed to reduce the thickness of the seat to make it more proportional. I decreased the thickness so that the centre measures 35 mm and the edges measure 60 mm. This adjustment makes the seat much more proportional to the legs and improves the overall shape.

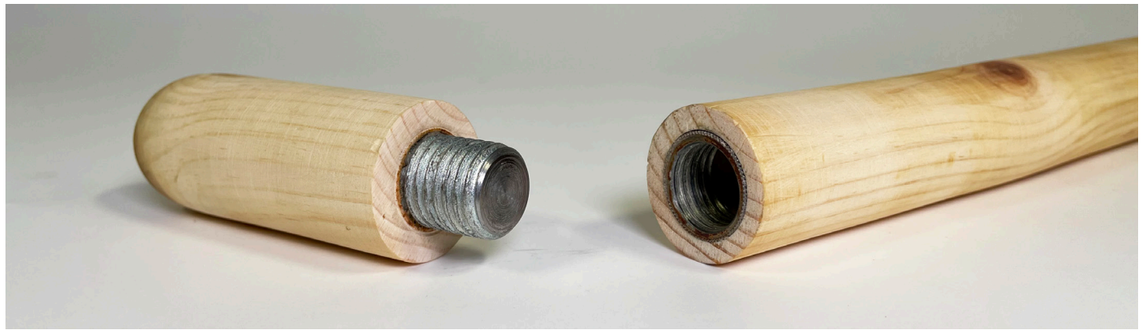


MENDING TOOL



To improve the repairability of the stool, I plan to include a felting tool within one of the legs. The idea is that the bottom of one of the stool's legs will be removable, allowing it to function as a felting tool for mending and fixing the felt cover if needed.





For my prototype, I used pine for the legs because it was affordable and readily available. However, since pine is an extremely soft wood, attempting to add the threads to the handle end caused the wood to tear. Therefore, for this prototype, I used a metal bolt and nut to create a more stable connection. The final design will be made entirely from wood.

The final design will be made from solid timber, featuring a threaded section at the top that will screw into a tapped hole in the end of the leg, making it easy to unscrew.

NATURAL DYING

Natural dyes offer a more environmentally friendly alternative to chemical dyes, primarily due to their lower pollution impact. The main environmental concern in dyeing is the waste generated, but natural dyes are biodegradable, meaning they do not contribute to pollution when disposed of. The process of obtaining these dyes is simpler, often requiring just the boiling of plant materials, which involves fewer steps compared to the more complex chemical dyeing procedures (Stanton 2019).

Additionally, natural dyes are typically sourced from renewable resources, particularly plants, ensuring that they can be sustainably harvested without depleting natural reserves*. This makes natural dyes a more responsible choice for both the environment and future generations (Bell 2022).

Figure 14, Forest dyes

Figure 15, Herbul dyes

Mordanting is the process of treating fibres with a mordant, which helps improve the dyeing results by ensuring that colours adhere better and remain vibrant. By using mordants, I can achieve brighter and more vivid hues that remain permanently locked in the fibres, which means no running or fading when the fabrics are washed (Helmenstine 2021).

Additionally, experimenting with different mordants allows for a range of colours and tones, adding depth and creativity to my project. Since I want my work to have longevity, it's essential that the colours stay true over time. Also, opting to create unique, bright, and durable felt can enhance the overall quality of my project. This makes it even more resilient and suitable for long-lasting use and opens it up for more consumers.

Figure 16, Shades of yellow

I have chosen to use alum (potassium aluminium sulfate), a very common mordant used to dye cloth, particularly when using natural dyes. Alum is considered a sustainable choice and is safe and non-toxic when used in such small quantities. It is readily available as it comes from naturally occurring mineral deposits. Its environmental impact is less than that of many synthetic alternatives, making it a better option for dyeing processes(Helmenstine 2024).

FELT DYING TESTS

After gaining knowledge and understanding the process of natural dyeing, I began testing different sources to explore the colours I could use. I started by treating half of my wool samples with alum to see how mordanting would affect the dyes. I left the samples overnight to ensure they were fully treated.

Once they had settled, I used three different sources to create dye: turmeric, beetroot, and onion skins. Each source was placed in a pot with water and boiled for 30 minutes to begin extracting the colour. I then added the wool samples to the pot. The samples and dye sources were left to simmer for 1-2 hours, being stirred occasionally throughout the process.

There was a noticeable difference between the treated and untreated samples for turmeric and onion skins, but the beetroot samples appeared quite similar. After boiling, the samples were left overnight to further absorb the colour. Once completed, the samples were thoroughly rinsed and dried.

In the end, I identified five colours to consider: bright yellow from untreated wool and turmeric, bright orange from treated turmeric, pinkish-red from both beetroot samples, muddy green from treated onion skins, and muddy orange from untreated onion skins.

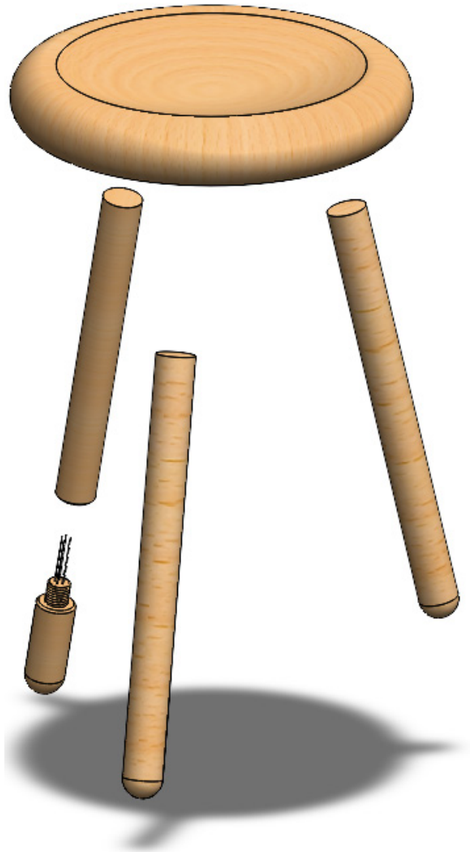
DEVELOPMENT REFLECTION

In developing my final design, I focused on creating a simple stool that showcased felt as the primary feature. Using CAD modelling was essential, allowing me to make precise adjustments and visualise my design's proportions. This virtual representation helped me experiment with dimensions and aesthetics before moving to the physical prototype, streamlining the design process and ensuring efficient construction.

The main goal of the project was to demonstrate that felt can be a sustainable alternative to traditional materials. I chose a simple design to highlight the durability and strength of felt. Features like a drawstring added practicality while maintaining focus on the material itself, which proved to be robust and fit for purpose.

The dyeing process produced vibrant and eye-catching colours, especially with materials like turmeric, reinforcing my belief in the versatility of natural dyes. If I had more time, I would have liked to experiment with other dyes, such as black bean, to explore richer hues of blue and red.

Despite the advantages of the modelling tool, I faced some challenges during the final iteration. One was ensuring the two parts of the stool aligned perfectly, which is crucial for both aesthetics and functionality. I also had practical concerns, like replacing broken needles during construction and refining the handle's shape for better ergonomics.



Overall, this project has deepened my understanding of needle felting. Moving forward, I plan to address these issues and refine my design, even if the final prototype lacks some details due to time constraints. I aim to clearly demonstrate through other models that my ideas can be effectively realized.

Moving forward, my next step will include manufacturing a final prototype. I will create detailed CAD designs to support this and render another stool, incorporating any details I may have missed in the initial prototype. I will also decide on the final look, including the colour I will use to dye the top, as well as the type of wood and stain I will choose.

FINAL PROTOTYPE

Felting the Cover for Final Prototype

- A foam mould was cut on a CNC machine to match the same radius as the seat.
- Started with loose, fluffy wool fibres obtained from the fleece I processed.
- Gradually built up more layers of fibres, felting between each layer.
- The final stage involved neatening the bottom edges by felting loose strands into the main body.
- Added a yarn drawstring that will be dyed to a similar colour to the felt.

Final Prototype Manufacturing

- Legs were turned and the mending tool was made using previous processes; then, I cut all the legs to the same size.
- For the prototype, the seat top was CNC machined from MDF, but the final design will feature a solid wood top.
- Tried fitting all the legs, then glued, sanded, and assembled the seat and wall parts.

MATERIAL CONSIDERATION

For this prototype, materials are chosen for their availability and practicality, but several improvements are needed for the final design.

The wool is sourced from **Skipton**, northwest of Leeds. Thanks to the extensive sheep farming in the UK, sourcing wool is less critical compared to timber. This project prioritizes local materials and aims to enhance the use of British wool. I plan to pair this with a durable native British timber to ensure the stool's longevity.

Figure 17, Skipton location

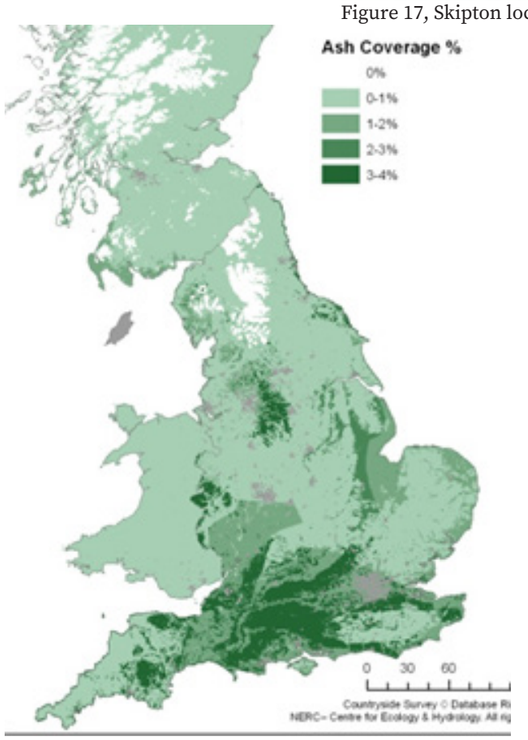


Figure 18, Ash tree coverage UK

Ash dieback has severely affected ash trees, leading many suppliers to source ash from Europe. Despite an estimated 98 million ash trees in the UK as of 2020 (Kalkowoski 2020), I envision the final product made from British ash. Using this local resource will support UK ash tree conservation efforts and positively impact local economies and ecosystems.

FINAL REFLECTION

Looking back on the recent project, I'm really pleased with how the overall construction turned out and how comfortable the seating is, both with and without the felt cover. That said, I did run into some issues with the legs: they were a bit bowed and had an unexpected diameter, which caused one leg to fit a little loosely, about 1-2mm smaller than I intended. If I had more time, I'd tweak the design to include a slightly smaller hole for a better fit next time.

I also think it's worth considering the materials we used. We went with pine and MDF for the final product, but I'm thinking about switching to ash hardwood instead for better durability and strength, which would up the quality of the stool.

There was a significant hiccup with the mending tool being misaligned with the main leg. If I could spend more time on this, I'd aim for a better finish overall. The pin we used ended up being too soft for the wooden thread, so going with hardwood could fix that issue and improve the look of the piece, too. I'm also considering exaggerating the gap between the tool and the leg to create a shadow effect—this could draw attention to some hidden design elements while minimizing any visible misalignments.

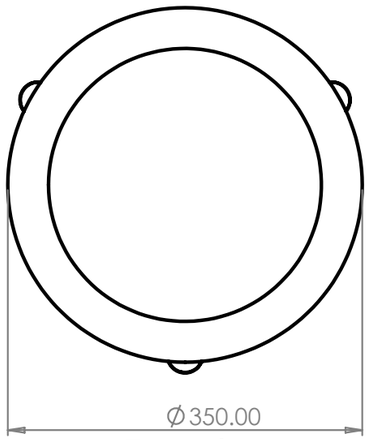
As for the final felt cover, I initially dyed it yellow, but I see an opportunity to expand the colour options with natural dyes like red, blue, and orange to make it more appealing for sales.

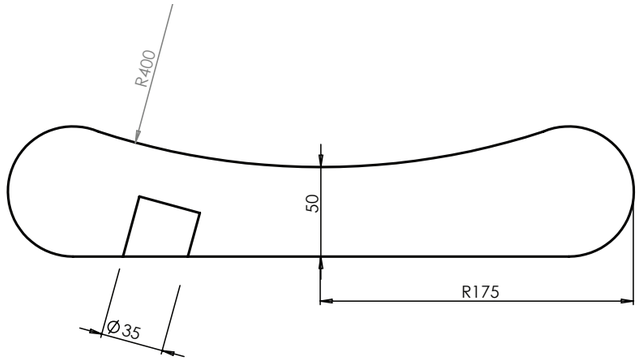
Looking ahead, there are ways to boost marketability. The current method of making the cover is time-consuming, so adapting some tools, like potentially using felting guns, could speed things up. It might mean focusing on smaller pieces, but it's worth a shot. Overall, I'm proud of what we accomplished, but there's still plenty of room for improvement to enhance functionality and market appeal if we had more time.

BAA STOOL

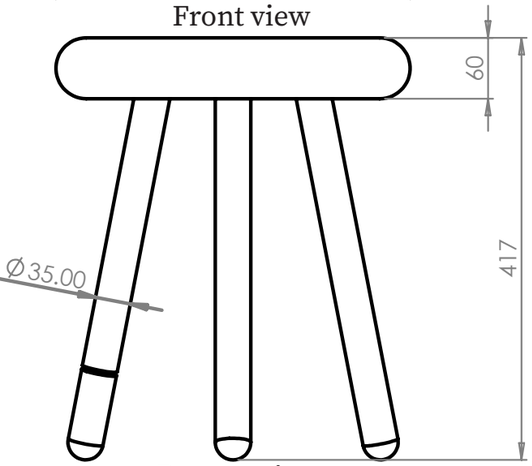
TECNICAL BOARD

Top view

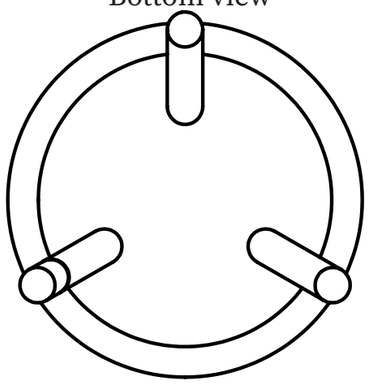




Front view

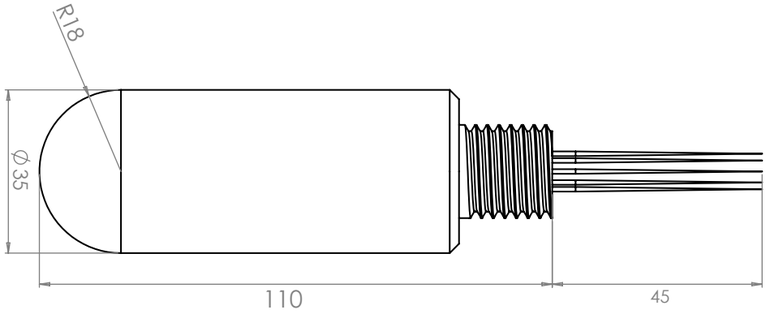


Bottom view

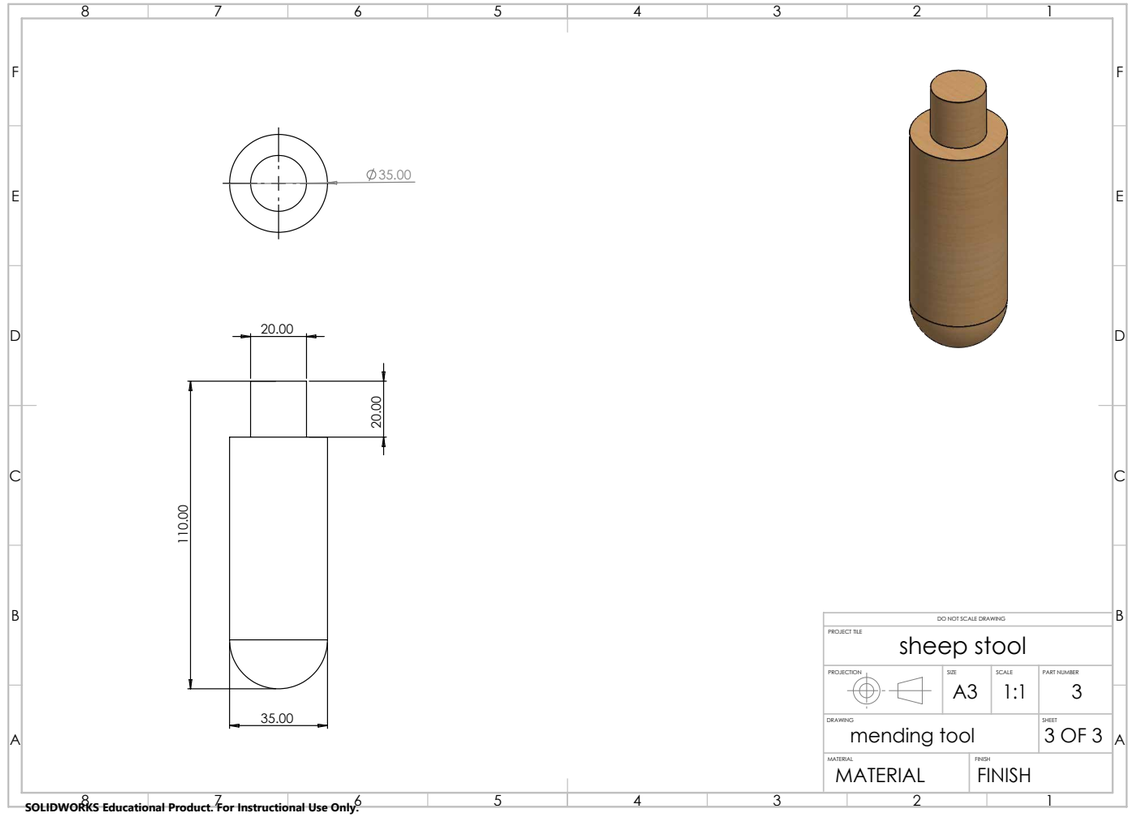


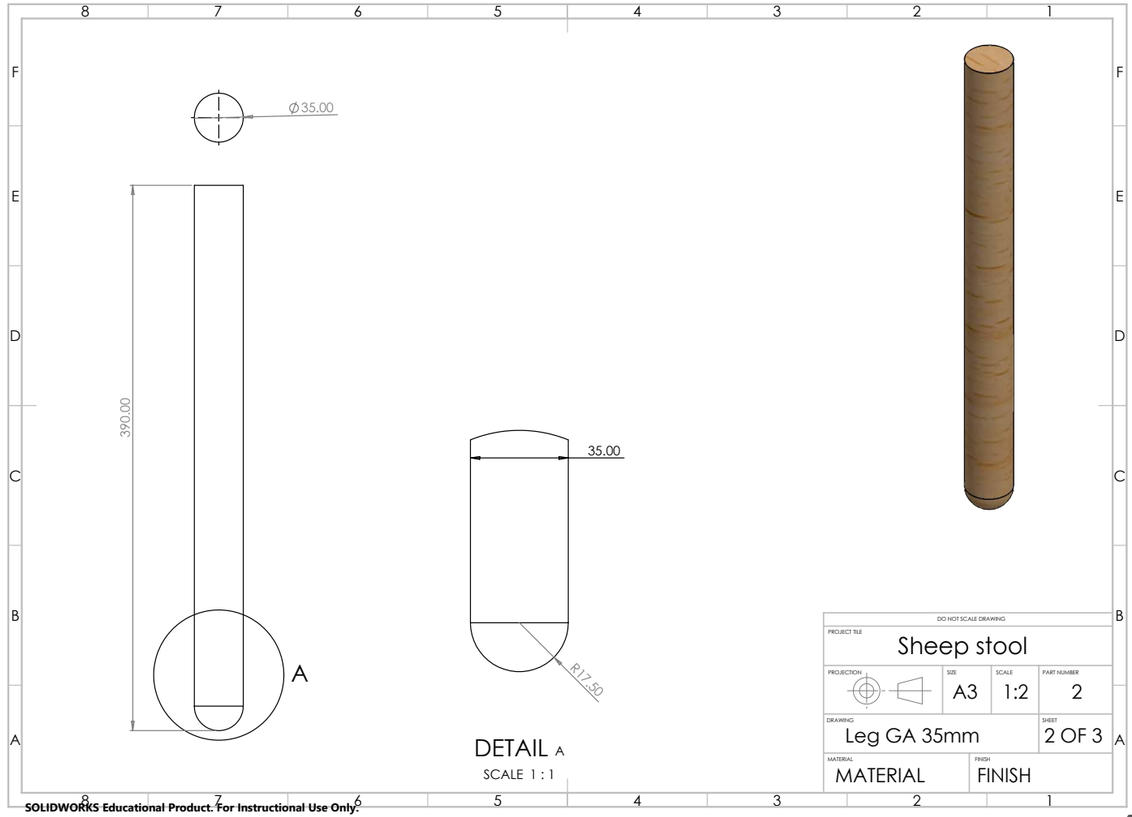
The cover is made from 100% British wool, created using knitted felting around a foam mould. Same dimensions as the wooden seat, attached using drawstrings.

The main wooden stool will be manufactured from British Ash. The top is CNC, and the legs are all hand-turned.



Mending tool features five steel felting needles with a threaded top so that it can screw into the leg.





FINAL PROTOTYPE

REFERENCES

Projects2025. [online]. Available at: https://www.instructables.com/ [Accessed May 14 2025].

BELL, J., 2022. Sustainable Dyes: Is Conscious Color Possible? [online]. Available at: https://www.sustainablejungle.com/sustainable-dyes/ [Accessed May 14 2025].

HAWORTH, 2025. Sustainability [online]. Available at: https://www.haworth.com/na/en/about/about-haworth/sustainability [Accessed May 14 2025].

HELMENSTINE, A., 2024. Get the Facts About Alum and How It's Used in Everyday Life [online]. Available at: https://www.thoughtco.com/what-is-alum-608508 [Accessed May 14 2025].

HELMENSTINE, A., 2021. What Is a Mordant? Definition and Examples.

KALKOWOSKI, J., 2020. Fighting ash dieback and protecting the future of our woodlands – Inside DIO.

STANTON, A., 2019. How Do Natural Dyes Compare To Synthetic Dyes? .

STRANTFORD, O., 2025. The Monk Chair: Designed Yesterday for Tomorrow [online]. Available at: https://www.molteni.it/magazine/en/article/the-monk-chair [Accessed May 14 2025].

IMAGE LIST

Figure 1 https://www.farmingads.co.uk/high-quality-black-welsh-mountains/livestock/825049

Figure 2 https://www.farmersguardian.com/news/4410604/study-reveals-sheep-smarter-goats-alpacas

Figure 3 https://www.raisingsheep.net/clun-forest-sheep

Figure 4 https://kerryhillsheepsociety.com/sheep-for-sale/

Figure 5 https://www.gettyimages.co.uk/search/2/image?phrase=gimmer+lamb

Figure 6 https://www.istockphoto.com/photo/merino-wool-in-hands-of-an-old-woman-gm476928284-66297121

Figure 7 https://www.istockphoto.com/search/2/image-film?phrase=cleaning%20sheeps%20wool

Figure 8 KiraVolkov Stock Image and Video Portfolio - iStock

Figure 9 https://abigailstevens.bergbuilds.domains/hst137/week-6-blog-post/

Figure 10 TUMAR, 2024, making of felt slippers [Photography] TUMAR, https://tumar-sib.ru/proizvodstvo

Figure 11 https://molteni.it/magazine/en/article/the-monk-chair

Figure 12 https://theofficecrowd.com/collections/office-chair-parts?gad_source=1&gad_campaignid=22047764531&gbraid=0AAAAA-b5B7rM4h0NIEYP0SX9cQ2gkkg7P&gclid=CjwKCAjw56DBBhAkEiwAaFsG-o6RVgTzJzsVd-x_Y-ZOPfhlwrnbLl5dAAYI0WrtCZp5zs3QlgAZFhoCfNcQAvD_BwE

Figure 13, EFG, 2020, EVO assembly. [Photography] EFG https://imagebank.efg.info/?free_text=EFG%20Evo&product_areas=&product_names=&product_types=&designers=&image_types=&article_numbers=&internal=0&hidden=0&order_by=created_date_desc&page=2

Figure 14, https://www.instagram.com/p/B1W6ao8phDC/?igshid=1ijltk0az3av7&epik=dj0yJnU9NGRoMUhjMTBiYlNlWkVfMkV3NnlXOFgtNmh3X2RyR1MmcD0wJm49eWZFT0tRMlNoMHpidFE4aWpER2pGdyZ0PUFBQUFBR2dvaElv

Figure 15 https://unsplash.com/s/photos/natural-dye-samoples

Figure 16 https://abeautifulmess.com/experimenting-with-natural-dyes/

Figure 17 https://www.google.com/maps?sca_esv=376a3409f9ec4160&rlz=1C1GCEA_enGB1077GB1077&output=search&q=google+maps+skipton

Figure 18 https://cehsciencenews.blogspot.com/2012/11/mapping-distribution-of-ash-trees.html