

STEAMing Up Your Library Classes, Workshops, and Events

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Ask Questions & Construct Explanations

- What observations do you have?
- What is the problem?
- What can you change/do to help us answer this?
- Do you have evidence/data to support this?
- Can you communicate to the group what is going on?

Transform Your Vocabulary with Engineering Verbs

Accelerate	Decrease	Increase	Optimize
Adapt	Elevate	Lighten	Reinforce
Alleviate	Eliminate	Maximize	Stabilize
Condense	Improve	Minimize	Strengthen

Use the Engineering Process to Define Problems and Solutions

1. ASK

- **What's the problem?**
- How have others approached it?
- What are your constraints?

2. IMAGINE

- What are some of your ideas or solutions?
- Brainstorm ideas.
- What one will work best?

3. PLAN

- Draw it!
- **Make a list of materials that you'll need.**

4. CREATE

- Go for it!
- Make it!
- Try it out!

5. IMPROVE

- **What works? What didn't?**
- Try it again, and make it even better!

Useful Websites

Projects

<http://tryengineering.org>

<https://www.teachengineering.org/>

<http://www.instructables.com/id/100-STEAM-Projects-for-Educators/>

<https://www.exploratorium.edu/education/designing-teaching-learning-tools>

Buck Institute (Project-Based Learning): <http://www.bie.org/>

<http://createmakelearn.blogspot.com/>

Ideas

Pinterest: STEM, STEAM, or STREAM Activities

Twitter: #STEM

Chameleon Scarf (Adafruit.com): <https://youtu.be/TPNk2BRWX64>

Shibori Dyeing:

Indigo Dye Kit: Amazon

Silk Scarves: www.dharmatrading.com

NYS STEM Education / Standards

P-12 Science and Engineering Learning Standards:

<http://www.p12.nysed.gov/ciai/mst/sci/documents/p-12-science-learning-standards.pdf>

<http://www.nysstemeducation.org/>

Collaboration

Empire State STEM Learning Network:

<http://www.nysstemeducation.org/empire-state-stem-learning-network/>

Article on Bees

<http://www.sciencemag.org/news/2017/02/bumble-bees-are-surprisingly-innovative>

Wet Felting Basics...Two Hands and Clean Fun

Felting is one of the oldest and simplest techniques for making fabric. It requires no specialized equipment or skill. Novices can achieve delightful results experimenting with wool and basic tools found around the house. This 'how-to' provides basic wet felting tips – additional info can be found on-line, at your local knitting shop, library, bookstore, etc.

Animal hair felts because of its unique combination of qualities: the physical structure of the fiber shaft and its molecular make-up. **Of all the animal fibers, sheep's wool felts the fastest.** If you examined wool fiber under a microscope, you would see that it is covered by a series of overlapping scales with serrated edges. Each scale can splay out from the shaft creating a little gap into which other scales can interlock. Human hair has similar properties; we use conditioner after shampooing to smooth down the scales on the hair shaft and to de-tangle it from the others. Wool, like other animal fibers, is made of the protein keratin. Keratin, if examined on a molecular level, exists in a spiral formation and gives wool elasticity that makes the fiber springy. When many fibers are rubbed together under the right conditions, the scales open out like little umbrellas and the elasticity in the fibers allows them to spring into each other, hooking their scales and tangling. *Think of felt as the ultimate bad hair day!*

The right conditions for felting

Five elements facilitate felting:

MOISTURE – WATER ALLOWS THE WOOL FIBERS TO SWELL AND THE SCALES PUSH OUTWARD.

SOAP – A NEUTRAL SOLUTION WITH PH LEVELS BETWEEN 7 AND 8 (6 CUPS WATER & 1 TSP. DAWN LIQUID DISH SOAP IN A PLASTIC PITCHER – NOT TOO MUCH SUDS!!!).

HEAT – WATER TEMPERATURE WILL DETERMINE HOW QUICKLY THE WOOL WILL FELT (104 – 122 F). SO, USE WATER AS HOT AS POSSIBLE, ALTERNATING HOT & COLD.

AGITATION AND PRESSURE – PRESSURE AND MOVEMENT IS REQUIRED SO THAT THE FIBERS COME TOGETHER.

The basic felting steps

Preparing the Fleece – **Felting can be very freeform...there's no hard 'rules'.** With a little practice, you'll master a few '*techniques*', but feel free to experiment and develop your own! I prefer to use fleece washed and commercially carded into a batt or roving. Hand-carded batts or rovings will work fine and need not be washed if you felt with soapy water. When preparing the wool for felting, you want *uniform thickness and evenness*. Thin places in batts or roving become HOLES in felt. Additional materials, such as yarn, twisted pieces of fleece, crimped locks, other natural fibers, etc. may be layered on top for additional texture and interest.

Building Layers of Fleece – You can work the built-up layers of fleece directly with soap and water on a felting surface or you can enclose the layers in an 'envelope of fabric' to keep things from moving around too much. Nylon netting (sometimes this gets entangled with wool), old sheets, sheer curtains or garage sale yardage, bubble wrap, etc works well. Lay out a piece of netting a bit larger than your intended piece of felt. Layer a thin layer of wool on the netting trying to keep the "grain" of the batt going north/south. Add a second layer of wool the same thickness with the "grain" going east/west. Add a third layer with the "grain" going north/south again. This is the basic felt layering. The more layers, the thicker/heavier your resulting FELT. You can add as many layers as you wish, but keep alternating them directionally for strength. Now fold the netting over the wool square and secure. You can baste a stitch or two...if you feel necessary. Truthfully...I don't 'envelope' my felt projects anymore. TIP: Sometimes I add netting *between* my layers to provide additional strength to the felt – depending on the 'project'.

Hardening the Fibers – Now comes the wet part! Move your **package to the sink, tub or other ‘wetable’ work surface**. TIP: I work in a new kitty litter pan or right in the bath tub – it depends on the size of felt project. Sprinkle the package sparingly with hot soapy water to *flatten down* the fibers together. Continue until everything is thoroughly wetted. Now begin to moosh and goosh the packet, rub it in a circular motion, on a ribbed surface or bubble wrap and keep pressing away. The idea is to open up the scales with the hot soapy water, entangle the fibers by friction and keep it up until everything is shrunken together. If you keep the wool hot, or alternate hot and cold, felting **will go faster...but it will happen at any temperature with enough agitation. Check the ‘package’** every so often to see if it is felting. Peek into an edge or corner to see if it is meshing (try to pull apart the layers). Once it has meshed into a felt fabric, you can go on to the milling stage.

Milling (or Fulling) – The purpose of milling is to work the lightly felted piece to its finished level of felting. Once the fibers have meshed into a felted matrix, you can remove the net. Remember, once you become proficient, the netting is entirely optional. Now you can continue agitating, rubbing or rolling until it has the density or texture **you like. TIP: I like to use inexpensive Dollar Store ‘bamboo stick’ place mats. Just roll up your felt into the mat and work as you would dough. IMPORTANT TIP: The wool felt will shrink in the direction you’re working. So, rotate the piece to maintain a uniform piece...or desired effect. ALSO, look for vintage washboards for fulling!** At this point, **you can also put your piece in the drier to roll around for a bit...for added texture.**

Finishing – Once the felt is thoroughly matted and dense *to your heart’s desire*, rinse in clear tepid water until all the soap is removed. You may add 1 T vinegar to the final rinse and dry. You can roll your piece in a towel and lay it out to dry like a sweater. You may iron it dry to get a smoother surface or place it in the dryer knowing you will get a fluffier, more wrinkly piece. You can also pin-block it as you might for a fine garment. Once dry, the piece may be ironed, brushed softly for fuzziness, embellished with stitches or trimmed to any shape as you would any other sewing project. **AND...cut felt will not fray or unravel!**

In general, the finer or the coarser the fibers, the faster they will felt. As with the selection of spinning fibers, the finer the fiber, the softer it will be for wearing. The coarser the fiber, the more durable. Feel free to try felting all types of fibers you can find. Remember that the *art of felting* is a craft for all ages and can be fun for youngsters as well as warm-water therapy for those creaky fingers!