



### Spotlight on Environmental Careers: Focus on Textile Chemistry

Chemistry is the study of matter and change, so a chemist is someone who researches different substances and experiment with their properties. This helps them understand how they change in diverse environments. A textile chemist is a chemist who specifically works with various fibers and materials to understand their changes and reactions under distinct conditions. This can include dyeing and finishing chemistry, fiber, and polymer chemistry, and blending of textile materials which combines materials science and chemistry.

To become a textile chemist, one would need a bachelor's degree in chemistry or chemical engineering and can even look into receiving their Ph. D. in a more specialized area or specific material (ex. polymer chemistry). As an example, someone who is interested in sustainable fashion may look into becoming a textile chemist. They can focus on solve problems with longevity of materials, to create or enhance organic materials and dyes, and learn how to use recycled textiles in new products. This helps keep clothing out of landfills by creating longer lasting garments, keeps water cleaner by using all-natural dyes, and saves water by using organic or recycled cotton and other reused materials. Textile chemists also help battle climate change by reusing various resources and focusing on utilizing organic materials rather than synthetics and polyester which are made from crude oil and is very energy intensive to produce.



A chemist working in the lab. [Source](#).



Benefits of sustainable fashion and how we can help the environment with new discoveries and textile options. [Source](#).

Relevant classes include:

- Natural dyeing
- Ethical fashion
- Sustainable material sourcing
- Organic Chemistry of Polymers
- Polymer Applications and Technology
- Fiber and Polymer Microscopy

A textile chemist should be able to apply the principles of chemistry to processes that are used to test and create textiles. Skills required include critical thinking and problem-solving skills, along



A loom used to weave materials. [Source](#).



with analytical and organizational skills. Chemists are often working in the lab and perform a lot of trial-and-error tests.

### **Activity: Dyeing Fabric with Plants**

Clothing companies frequently use synthetic dyes because they are less expensive than natural options. Unfortunately, these dyes can be dangerous to human health and the health of the environment. Synthetic dyes require a lot of water – from creating them to actually using them in the dyeing process. That water then becomes contaminated from the synthetic dyes and can make its way back into the environment, polluting our waterways or our soil.

You can try using natural materials to dye fabrics right at home! Some options include...

- Avocado pits
  - Beet scraps
  - Red cabbage
  - Onion husks
  - Lemon peel
1. To do this, it is best to start with white fabric, then place your textiles in warm water with a splash of mild soap and let soak for approximately 30 minutes.
  2. Then, gather the plant materials you are choosing to dye with. The more plant materials you have the more concentrated your dye will be. If your household is small and you don't tend to have many scraps all at one time, they can be prepped and frozen until you are ready to use them. (If using; avocado pits will need to be cleaned and lemons will need to be peeled.)
  3. Place plant materials in a pot of water with a tablespoon of table salt and bring to a boil. Then bring to a simmer and cover for about one hour.
  4. Strain the dyed water **into another pot** (not down the drain because this is what we are using to dye our fabric). The solid materials can now be composted or tossed in the trash.
  5. Place your fabric in the dyed water and simmer for one hour. Then soak off of the heat for another 24 hours.
  6. Squeeze out the fabric and then rinse with cold water until water runs clear.
  7. Line dry and enjoy!

### [Buzzfeed: How to Dye Fabric with Food Scraps](#)

Even the popular food chain Chipotle has been using natural dyes! Of course, they go through a *lot* of avocados... which means a *lot* of avocado pits! Check out their story [here](#).

If you're interested in supporting sustainable fashion brands make sure to read the information on their website, such as their mission statement and reviews from current and former employees, as well as customers. You can also search for more general information about a brand and explore their social media page to see what they are advertising to their followers. Look at the language they use carefully,



examine their wording and certifications that accompany their sustainable claims, these can include [Fair Trade certifications](#) and [certified B Corporations](#).

### University of Cambridge Synthetic Biology - Bacteria Dyed Textiles

New methods for creating color on various fabrics has entered the textile industry. These involve deriving pigments that do not rely on chemical dyeing, but rather on dyes that are biologically produced using engineered bacteria. Using DNA that codes colors in animals and plants, bacteria are “tricked” into producing the same color. As another benefit, the process significantly decreases the amount of water needed to dye materials as well as decreases the energy necessary for the dyeing process. These measures are intended to be more environmentally friendly. To read more:

<https://www.synbio.cam.ac.uk/news/cambridge-synbio-startup-colorifix-wins-rainbow-seed-fund-201cbreaking-new-ground201d-award-at-bio-start-competition>

### Other related careers include...



*Environmental chemists* study how waste, pollution, and chemicals impact life on the planet including soil and water contamination. They search for ways to reduce and prevent negative effects from different types of pollution.

[Photo source.](#)



*A sustainable sourcing manager* focuses on developing and implementing sustainable sourcing tools and procedures that will push businesses forward without risking the health of the environment.

[Photo source.](#)



*Water chemists* study and test water and its impact on other elements. They also help add insight to designs, policies, and processes to help manage different areas.

[Photo source.](#)

All of these careers help us create a cleaner and more sustainable world.



### **New Jersey Student Learning Standards**

**HS-LS1-1** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

Connections to Engineering, Technology, and Applications of Science Influence of Engineering, Technology, and Science on Society and the Natural World ♣ Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

### Career Readiness, Life Literacies, and Key Skills

**Creativity and Innovation** Creativity includes the use of a wide range of idea-creation techniques (such as brainstorming) to generate new and worthwhile ideas (both incremental and radical concepts). Additionally, within creativity, flexibility is evident through the elaboration, refinement, analysis, and evaluation of ideas in order to maximize creative efforts. Originality and inventiveness in work may also be evident while understanding the real-world limits to adopting new ideas. Failure is viewed as an opportunity to learn and adapt as well as understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes.

For more ideas on how this material can be used in the area of environmental science, contact Kate Reilly, Manager of Education, Duke Farms at [kreilly@dukefarms.org](mailto:kreilly@dukefarms.org)