The Science of Style: Clothes and the Environment

Dear Educator,

Help students better understand connections between real-world choices and their environmental impact with this free educational program from Cotton Incorporated and the curriculum specialists at Young Minds Inspired. The program features activities that explore sustainability such as the biodegradability of natural fibers like cotton, and non-biodegradable fibers like polyester, while making learning about the environment, consumerism, and innovation both fun and impactful. The activities also feature STEAM-related career spotlights to connect learning to real-world applications.

We hope that you will share this program with other teachers. And please let us know your thoughts about the program at **ymiclassroom.com/feedback-scienceofstyle**. We look forward to hearing from you.

Sincerely,
Dr. Dominic Kinsley
Editor in Chief
Young Minds Inspired

Questions? Contact YMI toll-free at 1-800-859-8005 or by e-mail at **feedback@ymiclassroom.com**.

Target Audience

Grades 9-12

Concepts and Skills

Environmental science	Communication
Sustainability and systems thinking	Data analysis
Family and consumer sciences	Critical thinking
Career readiness	Research

Program Components

Available at **ymiclassroom.com/scienceofstyle**:

- This teacher's guide
- Four reproducible student activity sheets
- A standards chart
- An online feedback form

How to Use This Program

Photocopy the activity sheets for all students. Internet access is needed for Activities 1, 2, and 4. A portion of Activity 2 is best completed at home but can be done in class. Activity 3 requires index cards. Activity 4 should extend over 2 to 3 teaching periods plus homework time and requires resources for creating a PSA. As you complete the activities, discuss the STEAM career spotlights by having students share their thoughts on these potential careers.

Activity 1: Fashion and the Environment: Fact or Fiction?

Part 1. Introduce students to the differences between natural and synthetic fibers. Distribute the activity sheet and have students complete the "how much do you know" quiz. Review the answers below in a class discussion. Encourage students to share their thoughts on each point and to take notes for use in Part 2.

Answers:

1. **True.** Synthetic fibers used in clothing are made from plastic threads derived from petroleum, a fossil fuel.[1]
2. **True.** Cellulose is a major component of plant cell walls. Just as cellulose gives plants structure and form, cotton gives clothing strength and durability.[2]
3. **False.** About two-thirds of global fiber production is synthetic, with polyester being the large majority of this.[3]
4. **False.** Microplastics range from a fraction of the width of a strand of hair to 5 mm in size. Microplastics can be found in all oceans and may be harmful to marine life.[4,5]
5. **True.** All garments shed when washed. However, studies show that washing synthetics can release hundreds of thousands of non-biodegradable microplastic particles into water systems, where they can persist for centuries.[6]
6. **False.** The global apparel industry contributes 14% of total plastic pollution, approximately 8.3 million metric tons per year — almost 23 times the weight of the Empire State Building. This comes from packaging, fibers shed during production and use, along with discarded clothing, known as end-of-life apparel waste.[7]
7. **False.** Synthetic garments that are thrown out (end-of-life synthetic apparel) make up the bulk of plastic waste from apparel. These garments are macroplastics, or large plastic debris like plastic bags and fishing nets, which pollute oceans, landscapes, and waterways, and over time, can break down into smaller plastic particles or microplastics.[6]

8. **True.** The cellulose fibers in cotton break down naturally in the environment without negative impact on water, soil, or air. In fact, studies have shown that cotton microfibers from a cotton t-shirt will break down within months in the right environmental conditions.[2]

Parts 2 & 3. Have students work in teams or independently to complete the chart using the quiz answers and their own research (see Resources list below). To help students understand sustainability and how it applies to sustainable fashion, which involves creating and using clothes in ways that help protect the environment, share these videos with them in class: "What is Sustainability?" (**youtube.com/watch?v=zx04Kl8y4dE**) and "Cotton Today: Sustainability FAQs" (**ymiclassroom.com/scienceofstyle**). Plan time for students to share their research and opinions in small groups.

Sample Answers

What You Wear Matters!	Natural Fibers (like cotton)	Synthetic Fibers (like polyester)
Fiber origin	Plants, animals	Fossil fuels/plastic
Biodegradability	Fully biodegradable[7]	Not biodegradable[7]
Shedding characteristics	Shed cellulose[2]	Shed microplastics[7]
Overall contribution to microplastics pollution	100% natural fibers do not contribute to microplastic pollution[6]	Contribute the majority microplastics generated by the apparel industry[7]
Other differences (based on research)	Answers will vary	Answers will vary

Activity 2: Material Match-up

Part 1. Distribute the activity sheet and have students complete the chart. Review the answers together.
Answers: 1. natural, 2. synthetic, 3. natural, 4. natural, 5. synthetic, 6. synthetic, 7. synthetic

Parts 2 & 3. Have students take an inventory of fabric types by completing the chart at home. As an option, they may complete it in class by researching clothing and linens online. Once done, have students work in small groups to share their data and discuss their thoughts on the featured prompts. Ask: *What trends or patterns do you notice? What does this data tell us?* Follow up with a larger class discussion where groups provide verbal summaries of their discussions.

Activity 3: What You Wear Matters

Part 1. Distribute the activity sheet and review the global and U.S. textile data in a class discussion. Share these answers with students.
Answers: A. Sent to landfills: 66.4% (11.3 million tons).
B. Combustion with energy recovery (incinerated to create energy): 18.9% (3.22 million tons).
C. Recycled: 14.7% (2.51 million tons).[8]

Parts 2 & 3. Have students read the actionable steps they can take to help reduce textile waste and set personal sustainability goals they hope to achieve. Then have them discuss their goals, potential challenges, and solutions in small groups. Finally, have students use index cards to create a Class Pledge Wall to make their intentions visible, reinforcing the idea that individual choices can add up to meaningful change.

Activity 4: Conscious Consumers

Part 1. Distribute and review the activity sheet with students. Have them work with a partner to develop polling questions. Plan time for students to poll family and friends and share their findings. Aggregate the data results, including number of participants and, if possible, number of adults vs. youth respondents. Then have students analyze and interpret the data through class discussion. Use prompts such as: *Which questions had the most answers in common? What patterns or trends do you notice among the responses? Was there a difference between answers from kids and adults? What might be some reasons behind these trends? Did anything in the data surprise you? What does the data tell us about the need for further education and calls to action to help people better understand the problem of microplastics?*

Parts 2 & 3. Assign student groups to conduct research and prepare a PSA to help raise awareness about microplastics and the benefits of natural fibers.

There's More Online!

Visit **ymiclassroom.com/cotton** for the *Don't Sweat It!* program for grades 9-12, as well as classroom resources and lessons for grades 2-8.

Resources

- **thefabricofourlives.com**
- **cottontoday.cottoninc.com**
- **bluejeansgogreen.org**
- **ymiclassroom.com/cotton**

The Science of Style:
Clothes and the Environment

Sources

1. What You Wear Matters. *Plant Not Plastic Fact Sheet: Plant or Plastic? The Simple Health Choice Hidden on Your Clothing Tag.* Nov 2025. Available at https://cdn.prod.website-files.com/68909e4c870767b36140f392/6914b750edcc31f0519280f2_20251029_1100_20S_Cotton_Factsheet.pdf

2. Cotton Today. *The Fibers in Your Closet: Understanding Cellulose Biodegradability and the Effects of Chemical Treatment*. June 25, 2025. Available at https://cottontoday.cottoninc.com/understanding-cellulose-biodegradability/

3. What You Wear Matters. *Plant Not Plastic Fact Sheet*: *The Hidden Truth: What's Really in Your Wardrobe?* Sept 2025. Available at https://cdn.prod.website-files.com/68909e4c870767b36140f392/68b96d181bfffce6c6aabcfc_20250904_1130_20S_Cotton_Factsheet.pdf

4. U.S. National Science Foundation. *Researchers discover microplastics at all ocean depths.* June 16, 2025. Available at https://www.nsf.gov/news/researchers-discover-microplastics-all-ocean-depths

5. Cotton Today. *Stop the Cycle on Microplastics and Choose Cotton*. July 24, 2023. Available at https://cottontoday.cottoninc.com/stop-the-cycle-on-microplastics-and-choose-cotton

6. Cotton Today. *Breaking Free from Plastic: How Cotton Champions a More Responsible Textile Future.* Available at https://cottontoday.cottoninc.com/our-sustainability-story/microfibers/cotton-natural-fiber-microplastic-free

7. Cotton Today. *The Urgency of Addressing Plastic Pollution in the Apparel Industry*. July 15, 2024. Available at https://cottontoday.cottoninc.com/urgency-of-addressing-plastic-pollution-in-apparel-industry

8. United States Environmental Protection Agency. *Textiles: Material-Specific Data.* Last updated on March 19, 2026. Available at https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/textiles-material-specific-data

Activity 1

Fashion and the Environment: Fact or Fiction?

Part 1. It's fun to shop and wear the latest fashion, but it's important to remember that not all clothing choices are the same. Did you know that what you wear can impact the environment? Read each statement below. Circle *True* or *False* after each statement to learn why what you wear matters.

1. Synthetic clothing and textiles such as polyester, nylon, and acrylic are made from plastic threads. **true** **false**
2. Natural plant-based fibers like cotton are primarily composed of cellulose. **true** **false**
3. Synthetic textiles and garments make up about one-third of global fiber production. **true** **false**
4. Microplastics are tiny plastic particles 10 mm in size. **true** **false**
5. When we wash our clothes, microplastics enter our wastewater systems and eventually reach our rivers and oceans. **true** **false**
6. The global apparel industry contributes only 2% of the total plastic pollution that ends up in the natural environment each year. **true** **false**
7. Synthetic clothing that is thrown away contributes only a small portion of plastic pollution every year. **true** **false**
8. Cotton clothing is derived from plant sources and is biodegradable, making it sustainable. **true** **false**

Part 2. Using what you've learned in Part 1, complete the chart below to compare natural fibers like cotton to synthetic fibers like polyester, spandex, and acrylic. For additional information, check out:

- **cottontoday.cottoninc.com/our-sustainability-story/microfibers/cotton-natural-fiber-microplastic-free**
- **cottontoday.cottoninc.com/urgency-of-addressing-plastic-pollution-in-apparel-industry/**

What You Wear Matters!	Natural Fibers	Synthetic Fibers
Fiber origin		
Biodegradability		
Shedding characteristics		
Overall contribution to microplastics pollution		
Other differences (based on research)		

Part 3. Which is more sustainable — clothing made of natural fiber or synthetic? Write your opinion on the back of this sheet. Review your notes and research to include at least two evidence-based reasons to support your thinking.

Career Spotlight: Environmental Scientist

Environmental scientists study how human activities affect air, water, soil, and ecosystems. They collect samples, analyze data, and use scientific tools to investigate issues such as pollution, chemical exposure, climate impacts, and microplastics. In the textile industry, they may compare the environmental impacts of different fibers, study how materials break down in the environment, and provide science-based information to guide decisions.

Education Requirements: Bachelor's Degree in environmental science, chemistry, biology, engineering, or a related field for entry-level positions. Advanced degrees may be needed for research, regulatory leadership, or specialized technical positions.

Activity 2

Material Match-up

Part 1. Learn more about fabrics that you wear every day. Read each fiber description and identify the fiber as natural or synthetic.

Fiber Characteristic/Description	Synthetic or Natural?
1. Sourced from renewable resources (living organisms).	
2. Durable, less breathable.[1]	
3. Examples include cotton, silk, wool, and linen.	
4. Durable, cool, breathable.[1,2]	
5. Petroleum-based materials are combined to form a compound that is extruded to form a threadlike substance used to make textiles.	
6. Examples include polyester, nylon, acrylic, and spandex.	
7. Sourced from non-renewable resources (fossil fuel-based chemicals).	

Part 2. Clothing labels may look small, but they hold a world of information about the materials you wear. Check out items in your closet and complete the chart below to learn about the fabric of some of your favorites.

Item	Fabric type	How the fabric feels	Natural or synthetic?	Biodegradable fabric? Yes or No	New or second-hand purchase	What you will do with the item when done with it
My favorite						
Shirt						
Pants						
Jeans (Denim)						
Sweatshirt						
Workout clothes						
Household items						
Blanket						
Pillowcase						
Towel						

Part 3. Discuss your chart results with your group. What is your preferred fabric overall? Is there a consensus on which fiber is better for the environment? Why or why not?

Career Spotlight: Textile Engineer

These engineers research and develop the processes and procedures for manufacturing fibers, yarns, and fabrics, including materials used in clothing and household textiles, as well as in office furniture, construction, energy, automotive, healthcare, and aerospace industries.

Education Requirements: Textile Science, Textile Design, and/or Textile Engineering, with a proficiency in digital and software applications and a mechanical aptitude.

1. MasterClass. *Natural vs. Synthetic Fibers: What's the Difference?* August 26, 2021. Available at https://www.masterclass.com/articles/natural-vs-synthetic-fibers#5MNqiG3tnWL3ZIrPg4HPSo
2. The Fabric of Our Lives. *Discover the Benefits of Cotton.* Available at https://thefabricofourlives.com/the-benefits-of-cotton/

Activity 3

What You Wear Matters

On a global level, up to 100 billion garments are produced each year, generating about 42 million tons of plastic waste. About 60% of the material used in this clothing is made from plastic. In addition, worldwide, about 92 million tons of textile waste is produced annually.[1]

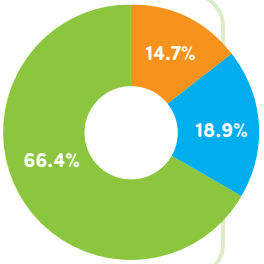
Part 1. According to the U.S. Environmental Protection Agency's 2018 textile report, the U.S. generated about 17 million tons of textile waste. What happens to these unwanted clothes?[2] Write the letter for the outcome on the line for the percentage that you think matches.

Outcomes:

A. Sent to landfills ____ 14.7% (2.51 million tons)

B. Combustion with energy recovery (incinerated to create energy) ____ 18.9% (3.22 million tons)

C. Recycled ____ 66.4% (11.3 million tons)



Part 2. Take charge of your closet! Check out actions you can take to reduce the environmental impact of your clothing choices.

- Read the clothing tag. Buy clothing made of natural, biodegradable fibers like cotton.
- Reuse or recycle clothing you no longer want or need. Donate to friends and family, or to community and charity organizations.
- Get creative — re-purpose or repair! A fun patch brings new life to ripped jeans, and an outgrown or stained t-shirt can become a cleaning rag, tote bag, or even a pet toy. Learn a few simple hand stitches to sew small repairs yourself.

- Resist the urge to splurge. Reducing the amount of clothing you buy can make a difference.
- Shop second-hand at thrift or consignment stores or swap gently used clothing at community swap events.
- Don't overuse the laundry! For an item worn briefly, maybe it could be worn again before washing it.

Recycle Cotton Denim

Thanks to the natural, sustainable properties of cotton fibers, authentic denim clothing can be transformed rather than thrown away. Blue Jeans Go Green™ is a sustainability program that recycles cotton denim and turns it into pet beds, building insulation, and thermal packaging liners. Find out more at **bluejeansgogreen.org**.

Part 3. On the back of this sheet, list three sustainable actions you will pledge to take to help reduce textile and synthetic waste in your closet. Identify a challenge you might face in achieving a goal. How can you overcome this challenge?

Career Spotlight: Natural Fiber Product Development & Sourcing Managers

These managers work with corporations and industries on a global scale to manage long-term projects that help reduce the environmental effects caused by production of goods. This includes working to lessen air and water pollution, deforestation, and other negative practices that can occur through the product development and supply chain process.

Education Requirements: Bachelor's Degree in Environmental Science, Sustainability, Engineering, or a related field such as Business Administration. Knowledge of fabric design is also a practical skill for this field.

1. TheRoundup.org. *17 Most Worrying Textile Waste Statistics & Facts.* January 27, 2026. Available at https://theroundup.org/textile-waste-statistics

2. United States Environmental Protection Agency. *Textiles: Material-Specific Data.* Last updated on March 19, 2026. Available at https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/textiles-material-specific-data

Activity 4

Conscious Consumers

A conscious consumer is one whose fashion, style, and purchase decisions are based on the impact they have on the environment, economy, and society. Spreading the word about choosing natural fibers can help the people around you become informed consumers.

Part 1. First, find out what others think. Below are some suggested poll questions for collecting data. Add your own questions in the blank spaces. Then poll two or more friends or family members and record their responses.

Polling Questions	Person 1	Person 2
1. Do you check clothing and textile tags for information on fiber content? (yes or no)		
2. Did you know that washing a single load of synthetic clothing can release hundreds of thousands of tiny plastic particles into water systems? (yes or no)		
3. Is biodegradability or sustainability a factor in your decision when buying a new outfit? (yes or no)		
4. Which of these actions would you be most likely to take to reduce microplastic shedding? **A.** Buy natural fiber-based clothing like cotton more often **B.** Wash clothes in cold water to reduce fiber shedding **C.** Wash clothes less often when possible		
5. How concerned are you about the accumulation of microplastics in our water systems? (unconcerned or concerned)		
6.		
7.		

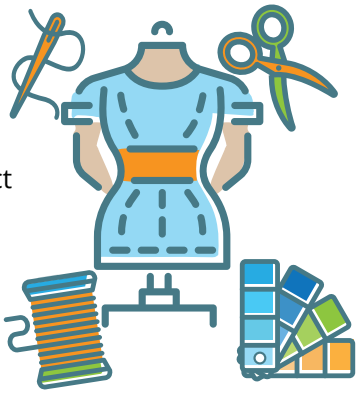
Part 2. Find out more about the impact of microplastics and the benefits of biodegradability. Record at least three important findings on the back of this sheet. Some research sites include:

- Cotton Today
  - **cottontoday.cottoninc.com/our-sustainability-story/microfibers/cotton-natural-fiber-microplastic-free/**
  - **cottontoday.cottoninc.com/plastic-pollution-persists-cotton-fiber-a-biodegradable-solution/**
- United Nations **unep.org/news-and-stories/story/everything-you-should-know-about-microplastics**

Part 3. Using the information collected through your survey and research, what would your key message be for a public service announcement (PSA) to create awareness about reducing microplastics in clothing? Create a slogan for your idea. Then use these PSA pointers to create a poster, social media post, or slide show of your PSA:

- Present a clear message.
- Offer a call to action through ideas for behavioral change.
- Balance text and graphics.
- Know your audience and use words and imagery that speak to them. Be creative!

Career Spotlight: Fashion Designer



Designers use creativity and their understanding of what consumers want to make apparel and home products. Sustainability and conscious consumerism, such as a demand for natural fibers, can affect design. Artistic ability, attention to detail, communication, technical knowledge, and observation skills are key. **Education Requirements:** Bachelor's Degree in Fine Arts or Business, such as fashion design or merchandising.