Cotton

*Lesson Plan for Grade 6, English Language Arts & Social Studies*

*Prepared by NAITC*

*Modified by Mississippi State University, School of Human Sciences*

*for Mississippi Farm Bureau Federation - AITC*

# OVERVIEW & PURPOSE

Students will gain a broad understanding of the types and sources of different fibers, examining their origins and observing their differences. Activities in this lesson include examining clothing and clothing labels and observing how different types of fabrics burn.

# EDUCATION STANDARDS

**Mississippi College-and-Career Readiness Standards:**

E.6.1 Explain the concept of natural resources and how people use and value them.

RI.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others’ ideas and expressing their own clearly.

**NALOs**

T2.6-8.d Identify renewable and nonrenewable energy sources

T2.6-8.f Identify where labeling indicates the origin of food and fiber

OBJECTIVES

* Students will be able to differentiate between the different types and sources of fibers.
* Students will be able to demonstrate how to spin wool.
* Students will be able to describe how different types of fabric burn.

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# MATERIALS NEEDED

Interest Approach

* [The Incredibles - Family Suits scene](https://www.youtube.com/watch?v=Z-Ij7ElJnqM) video

Activity 1:

* Suitcase of clothing items made from various materials and in various countries
* [Clothing Investigations activity sheet](https://cdn.agclassroom.org/media/uploads/2020/02/04/Clothing_Investigations_activity_sheet.pdf), 1 per student or group of students
* [World Map](https://cdn.agclassroom.org/media/uploads/2016/07/25/world_map.pdf)
* [Natural Fibers, Synthetic Fibers handout](https://cdn.agclassroom.org/media/uploads/2016/07/25/natural_synthetic_fibers_handout.pdf)
* [*Clothing Rack Consumer and Historian* handout and activity sheets](https://cdn.agclassroom.org/media/uploads/2016/07/25/clothingrack_handout_activitysheets.pdf)

Activity 2:

* Carded wool
* Wool spinning hooks

\*Both of these items are included in the [Wool Spinning Kit](https://agclassroomstore.com/search.php?search_query_adv=wool%20spinning&section=product), which is available for purchase from agclassroomstore.com.

* [Wool Spinning Tutorial](https://www.youtube.com/watch?v=xwnx1dIMSYo&feature=youtu.be)

Activity 3:

* [Great Balls of Fire activity sheet and questions](https://cdn.agclassroom.org/media/uploads/2016/07/25/great_fire_activitysheet_questions.pdf)
* 3" x 3" square swatches of wool, cotton, polyester, nylon, linen, acrylic, and silk fabrics
* Two deep glass dishes (beakers or Pyrex bowls)
* Lighter with adjustable flame
* Metal tongs
* Pitcher of water and fire extinguisher

Essential Links:

* [Answer Key](https://cdn.agclassroom.org/media/uploads/2016/07/25/answer_key.pdf)
* [Clothing Investigations activity sheet](https://cdn.agclassroom.org/media/uploads/2020/02/04/Clothing_Investigations_activity_sheet.pdf)
* [Clothing Rack Consumer and Historian Handout and Activity Sheets](https://cdn.agclassroom.org/media/uploads/2016/07/25/clothingrack_handout_activitysheets.pdf)
* [Great Balls of Fire Activity Sheet and Questions](https://cdn.agclassroom.org/media/uploads/2016/07/25/great_fire_activitysheet_questions.pdf)
* [Natural Fibers, Synthetic Fibers Handout](https://cdn.agclassroom.org/media/uploads/2016/07/25/natural_synthetic_fibers_handout.pdf)
* [World Map](https://cdn.agclassroom.org/media/uploads/2016/07/25/world_map.pdf)

# Lesson Set Up:

Interest Approach:

* Have the video [The Incredibles - Family Suits scene](https://www.youtube.com/watch?v=Z-Ij7ElJnqM) displayed on the screen

Activity 1:

* Have a suitcase of clothing items made from various materials and in various countries set up in the classroom for students to observe.
* Have a copy of the [Clothing Investigations activity sheet](https://cdn.agclassroom.org/media/uploads/2020/02/04/Clothing_Investigations_activity_sheet.pdf) for each student.
* Have the [World Map](https://cdn.agclassroom.org/media/uploads/2016/07/25/world_map.pdf) displayed on the screen.
* Have a copy of the [Natural Fibers, Synthetic Fibers Handout](https://cdn.agclassroom.org/media/uploads/2016/07/25/natural_synthetic_fibers_handout.pdf) ready to discuss with students.
* Have a copy of the [Clothing Rack Consumer and Historian Handout and Activity Sheets](https://cdn.agclassroom.org/media/uploads/2016/07/25/clothingrack_handout_activitysheets.pdf) for each student.

Activity 2:

* Have the [Wool Spinning Tutorial](https://www.youtube.com/watch?v=xwnx1dIMSYo&feature=youtu.be) displayed on the screen.
* Provide each student with a wool hook and a piece of carded wool approximately 1/4 inch wide and 14 inches long.

Activity 3:

* Have a copy of the [Great Balls of Fire Activity Sheet and Questions](https://cdn.agclassroom.org/media/uploads/2016/07/25/great_fire_activitysheet_questions.pdf) for each student.
* Have the necessary materials prepared:
  + 3" x 3" square swatches of wool, cotton, polyester, nylon, linen, acrylic, and silk fabrics
  + Two deep glass dishes (beakers or Pyrex bowls)
  + Lighter with adjustable flame
  + Metal tongs
  + Pitcher of water and fire extinguisher

# Vocabulary

**fiber:** thin thread of natural or artificial material that can be used to make yarn

**natural fiber:** fiber from a natural source, such as a plant or animal, that can be used to make yarn without chemical alteration

**nonrenewable resource:** limited natural resource that cannot be replaced or reproduced within a generation and cannot be managed for renewal. Examples: oil, soil, mineral resources (lead, iron, cobalt, zinc, etc.)

**renewable resource:** natural resource that can be replaced naturally or by human efforts at a sustainable rate; examples include forests, fish, wildlife, agriculture, plants, animals

**synthetic fiber:** fiber that is man-made; the original substance is chemically altered to form fiber that can be used to make yarn

**textile industry:** concerned with the design, production, and distribution of yarn, cloth, and clothing

**warp:** the set of lengthwise threads on a loom that are crossed at right angles by the weft

**weft:** thread or yarn which is drawn through the warp to create cloth

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# Ag Facts:

* The US textile industry supply chain—from textile fibers to apparel and other sewn products—employed an estimated 579,000 workers in 2015.
* The United States is the world leader in textile research and development, developing next generation textile materials such as conductive fabric with antistatic properties, electronic textiles that can monitor heart rate and other vital signs, antimicrobial fibers, lifesaving body armor, and new fabrics that adapt to the climate to make the wearer warmer or cooler.
* Mississippi ranks #3 in the United States in cotton and cottonseed production.
* In Mississippi in 2020, 780 cotton farms grew 1.3 million bales of cotton
* In Mississippi, the production value of cotton in 2020 was $491 million.
* Cotton is usually planted between April 28 and May 28 and is harvested between September 15 and November 17.
* One bale of cotton weighs about 500 pounds; the weight of a fully grown grizzly bear.
* Cotton is used in:
  + Cotton Cloth
  + Cellulose (For making plastics, explosives, batting, etc.)
  + Livestock Feed
  + Margarines and salad dressings
  + Enrichment of the soil

# Background Information for Teacher:

From traditional animal skins to high-tech synthetics, there are hundreds of types of fabrics available today. Almost all of our fabrics are made of fibers, including those used to make sheets, towels, curtains, and rugs. **Fibers** are thin threads. The hairs on your head are fibers. Like human hair, the fibers used to make fabric can be straight or curly, smooth or coarse. Most fibers can be lumped into two categories—natural and synthetic. Most **natural fibers** are the direct product of agriculture, while **synthetic fibers** are made by people.

Fiber is a word often used to describe something that should be in our diet. Many people think that farmers involved in the production of food and fiber are producing the things we need to eat. Fiber is in our food, but when farmers and other agriculturists use the term, they are talking about the fiber used to make our clothes. Fiber is the raw material that is long, strong, and pliable enough to be spun into yarns and woven into fabrics. The characteristics of fabric are determined by the type of fiber used and the weave or the knitting technique used. The same weave made using a different fiber will create a different type of fabric. Nature provides many different kinds of fibers that can be made into cloth. All the fibers gathered from plants and animals are called natural fibers. They have served people for centuries.

**Natural Fibers**

A variety of animals provide natural fibers. Wool comes from sheep. Llamas and their relatives, alpacas, guanacos, and vicuñas also provide a fiber called wool. Angora rabbits provide angora fiber and Angora goats provide mohair. Cashmere comes from Kashmir goats. The large white moth caterpillar, commonly called the silkworm, provides the finest silk. The fur and skins from animals such as mink, beaver, muskrats, and rabbits can also be found in clothing. Although leather is not a fiber, it is widely used as a fabric. Cattle hides are the source of most leathers, but the hides of pigs are also extensively used in soft leather goods.

Plants provide us with natural fibers for fabric as well. The world’s most important non-food crop is cotton. So many things are made of cotton that it would be hard to go through a day without using or wearing cotton cloth. Cotton has been found in tombs in India dating back to 3,000 BC. Linen, one of the world’s oldest fabrics, is made from the fiber of the flax plant. Lesser-known natural fibers such as ramie, jute, and hemp have many uses, varying from finely woven fabrics to rope.

**Synthetic Fibers**

Since the late 1800s people have had synthetic fiber options to choose from. These fibers are made by chemists, and they fall into two broad groups depending on their source. One group of fabrics is made from natural materials, such as cellulose, which are chemically converted into compounds that can be made into fiber. Most cellulose used for making synthetic fiber comes from softwoods or the short fibers sticking to cotton seeds. Rayon and acetate are cellulose-based fabrics.

The second group of synthetic fibers is formed solely from chemical compounds, most of which are by-products of the oil-refining process. These fibers can be woven into cloth and are often mixed with natural fibers. They are resilient, although some are easily damaged by high temperatures. Petroleum-based fabrics include Kevlar, nylon, polyester, acrylic, polypropylene, olefin, and spandex.

**Fibers and Natural Resources**

All fibers, whether natural or synthetic, have one thing in common. All are made from natural resources. Some natural resources are renewable because they are replenished by natural cycles. Fibers from trees, plants, and animals come from renewable natural resources. Even the synthetic fiber rayon is made from a **renewable resource**—the plant product cellulose. But not all natural resources can be regenerated or replaced naturally within a reasonable amount of time. It would take millions of years to replenish our oil and petroleum reserves—not a reasonable amount of time. Polyester, orlon, nylon, polypropylene, and spandex are made from oil and petroleum—**nonrenewable resource**s.

**Textile Processing and Careers**

It takes many steps and jobs to change fiber into a fabric that can be used to make clothing. Wool, for example, is first sheared from sheep. Then it is sorted by type and quality before it goes to a mill. In the mill, the wool is cleaned to remove dirt and grease. When the wool is clean, it can be dyed if desired. It is then carded to remove tangles and any remaining dirt. Carding turns the wool into long, soft strands that are then spun into yarn. Wool yarn is woven on looms or knitted into fabric. For wool or any fabric to be made into clothing, the fabric is sold to a clothes manufacturer. Clothing is designed and patterns are developed before the fabric is cut. The fabric is cut according to the pattern, sewn into a garment, and sold to stores. Finally, you, the consumer, buy the garment at the store—often after seeing some advertising. This process and the many careers involved make up the **textile industry**.

Jobs involved in producing and preparing clothing for the consumer may include agricultural producers (farmers and ranchers), plant and animal scientists, veterinarians, shearers, wool buyers, sorters, classers, carders, spinners, dyers, weavers, knitters, fabric designers, fabric buyers, clothes designers, pattern makers, seamstresses and tailors, advertising writers and artists, models and photographers, truckers, salesclerks, and more. There’s no question that the journey from resources to you involves many jobs, businesses, and industries all over the world.

**Cotton**

Cotton grows best where it stays warm and sunny for at least half of the year. Large amounts are grown in the southern United States, China, and India. In the United States, cotton farmers plant cotton in the late spring. They use mechanical planters that can plant seeds in as many as eight rows at a time. During the growing season, scouts go out into the fields to count harmful insects. If there are too many, the farmer will use pesticides to control them.

About two months after planting, flower buds (called squares) appear on the plant. Three weeks later the blossoms open. The petals change colors as they mature. First they are creamy white. Then they turn yellow, then pink, and finally, dark red. After three days the red flowers wither and fall, leaving green pods called cotton bolls.

The boll is shaped like a tiny football. Moist fibers grow and push out from the newly formed seeds. As the boll ripens, it turns brown. The fibers continue to expand in the warm sun. Finally they split the boll apart, and the fluffy cotton bursts out. Cotton is harvested in the fall. Most cotton is harvested by machine. After the cotton is harvested, it is stored at the edge of the field in big mounds or loaded on trailers or trucks and carried to the cotton gin. At the cotton gin powerful pipes suck the cotton into the building and through cleaning machines that remove burs and leaf trash. Then circular saws with small, sharp teeth pull the fiber from the seed. The ginned fiber is called lint. The lint is pressed into 480-pound bales that are about the size of a large refrigerator.

The bales are sold to cotton merchants who sell them to textile mills in the United States or in foreign countries. At the textile mills, huge machines spin the cotton fibers into cotton thread. The thread is then woven into cloth on looms. The rolls of cloth that come off the looms are called bolts. Clothing manufacturers buy bolts of cloth and cut jeans, shirts, dresses, and other items of clothing from them to sew.

**Wool**

Wool cloth is woven from yarn that is spun from the fibers grown as the thick fleece of sheep. Sheep wool comes in shades of black, white, and brown. There are several hundred breeds of sheep. (Generally, only hand spinners keep and raise colored sheep. Commercial wool producers discriminate against all but white sheep. Only white wool can be dyed.) Once a year, sheep have their fleeces cut off, or sheared. An experienced shearer can shear a sheep in 1–4 minutes. Wool is like hair in that it grows back.

After the wool of a sheep has been cut, or sheared, it is sent to the factory where it is washed, dyed, carded (brushed), and spun into yarn. Then it is ready to knit, crochet, or weave into a blanket, a rug, a sweater, a pair of socks, or something else. People who weave cloth set up the warp threads first. The **warp** threads are the threads that go up and down. The **weft threads** are woven side to side through the warp threads. This action locks the threads together. Today, most weaving is done in factories by machines. The machines are faster than the old-fashioned wooden looms, and the patterns they create are more uniform.

# LEARNING PROCEDURES

Interest Approach:

1. Show the video clip [The Incredibles - Family Suits scene](https://www.youtube.com/watch?v=Z-Ij7ElJnqM). In the clip Edna describes the properties of the fabric for each supersuit.
2. As a class brainstorm different careers that could have played a role in producing the supersuits. Consider the production of the fabric, the making of the supersuits, and how the suits might be marketed and distributed.
3. Tell students that you are now going to explore the materials that normal clothes are made from and the careers involved in their production.

Activity 1: Clothes from Around the World

1. Open a suitcase of various clothing items you have brought in. Pass out a piece of clothing to each student or group of students.
2. Either project the [Clothing Investigations activity sheet](https://cdn.agclassroom.org/media/uploads/2020/02/04/Clothing_Investigations_activity_sheet.pdf) to fill out as a class or pass out a copy to each student.
3. Ask students how they can determine what their clothes are made out of and where they were made.
4. Project the [World Map](https://cdn.agclassroom.org/media/uploads/2016/07/25/world_map.pdf). Ask your students to read the clothing labels, and mark where each piece was made on the map.
   1. **Optional Adaptation:** You may also give a copy of the map to each student to mark. If you do, project a [political world map](http://www.freeworldmaps.net/political.html), and ask your students to color and label the countries on their own maps.
5. Note on the *Clothing Investigations* activity sheet where each item was made.
6. Ask students to think more about the sources of these clothes: Where were most of the clothes made? Do they think the fibers were produced in the country where the article of clothing was made?
7. Discuss with students the differences between natural and synthetic fibers using the [Natural Fibers, Synthetic Fibers handout](https://cdn.agclassroom.org/media/uploads/2016/07/25/natural_synthetic_fibers_handout.pdf).
8. Remind students of the difference between renewable and nonrenewable resources.
   1. **Note:** If students are unfamiliar with the concept of renewable vs non-renewable resources, the lesson plans [Corn an A-maizing Plant](https://agclassroom.org/matrix/lesson/141/) and [Planet Zorcon](https://agclassroom.org/matrix/lesson/487/) provide activities for teaching the topic.
9. Ask students to determine how they would fill out the remaining columns on the *Clothing Investigations* activity sheet for their garments, and then ask them to share this information with the class.
10. Hand out the [*Clothing Rack Consumer and Historian* information sheet and activity sheets](https://cdn.agclassroom.org/media/uploads/2016/07/25/clothingrack_handout_activitysheets.pdf). Have students read and complete them independently.

Activity 2: Spinning Wool

1. Discuss how fibers are spun to make thread that will be made into cloth.
2. Spin wool with your students. You may purchase a Wool Spinning Kit (see *Materials*) or source your own carded wool and wool hooks. The hooks provided with the kit are chain-link fence ties; a piece of wire cut to 8 inches with the top inch bent down into a candy cane shape will also work. Provide each student with a wool hook and a piece of carded wool approximately 1/4 inch wide and 14 inches long. Guide students using the instructions given below. A [Wool Spinning Tutorial](https://www.youtube.com/watch?v=xwnx1dIMSYo&feature=youtu.be) video is also available.
3. If you are right-handed, place the hook in your right hand (left if you are left-handed).
4. Hold the wool near the top in your other hand and fold over the top 1/2 inch to make a loop in the top of the wool. Place the loop around the hook end of the wire.
5. Begin spinning the wool hook in one direction. As the wool spins and gets tight against your fingers, move your fingers down the wool, letting out more unspun fiber— this is called drafting. You are spinning! If you get bumps in your yarn, you are spinning too tight and should draft out more wool.
6. When you have spun the length of yarn, don’t let go or the yarn will unspin. You are now ready to ply your yarn. Plying is the twisting together of two single strands of spun wool. The easiest way to ply your yarn is to have someone place their finger in the center of your spun yarn (like you would place your finger on a ribbon for a package), bring the two ends together so the two strands are side by side and then have the person with their finger in the middle let go and allow the wool strands to twist together.
7. The double strand that you now have is plied yarn. It is strong and won’t unspin. Tie it around your wrist and make a bracelet or use it for a bookmark.
8. Tell students that in the next activity they will observe the fire resistant properties of wool.

Activity 3: Great Balls of Fire

*Note: This demonstration should be performed over a lab table or a table covered with aluminum foil. Clear the area of papers or debris. Make sure you know exactly what you are burning. A swatch that is 20% cotton and 80% polyester will burn differently than one that is 100% polyester. Dyes and fabric finishes may alter the flammability and burning patterns of fabrics. They may also affect the shape and color of the residue. Generally, however, fabrics will burn true to form.*

1. Provide each student with a copy of the [*Great Balls of Fire* activity sheet and questions](https://cdn.agclassroom.org/media/uploads/2016/07/25/great_fire_activitysheet_questions.pdf).
2. Show students the 3" x 3" fabric samples, and identify the type and source of the fiber (e.g., wool from sheep, linen from flax). Students should record the information observed and discussed throughout this activity on the *Great Balls of Fire!*activity sheet.
3. Assign one person as a timekeeper and provide him or her with a stopwatch or a watch with a second hand.
4. Hold one fabric swatch at a time with the tongs and light the edge. Have the timekeeper record how long it takes each sample to burn. Hold each sample above the glass dish so the class can observe the burning pattern. As the remains fall into the glass dish, point out the characteristics of the ash. Discuss the effect each material would have on a burn victim.
5. Have students complete the *Great Balls of Fire!* questions after the activity is completed.

**Concept Elaboration and Evaluation**

After conducting these activities, review and summarize the following key concepts:

* Natural fibers are produced by farmers and ranchers who raise fiber-producing plants and animals like cotton, flax, sheep, and alpacas.
* Clothing labels provide information on what the fabric is made from and where the clothing was made.
* Fiber can be made from renewable and nonrenewable resources.
* There are a wide variety of careers available related to the production of fiber and fabric.

Additional Learning Procedures

To help students review and elaborate more about cotton, try using the [“Think Pair Share”](https://drive.google.com/file/d/1fzOa97JspiF_qQQZ5tBnDeG3DEKgWm4Y/view?usp=drive_link) method to allow students to think deeper and make new connections.

Additional Things to Consider:

[Agricultural Interventions](https://agclassroom.org/matrix/resource/952/)

[Farm Crops](https://agclassroom.org/matrix/resource/309/)

[Farmer George Plants a Nation](https://agclassroom.org/matrix/resource/192/)

Source: <https://www.agclassroom.org/teacher/matrix/>

*The MS Farm Bureau Women’s Committee has additional resources to help aid you in this lesson such as a cotton gin, please contact Dedra Luke at 601-977-4169 to learn more!*

*For more information and additional lessons visit*

*https://msfb.org/ag-in-the-classroom/lesson-plans/.*