



Fibers and Agriculture

Middle School Food and Agricultural Literacy Curriculum

Precepts

- F. Continuous Improvement
- F5. Acquire new knowledge.

National Standards

- PS.01.01.02.a Describe the morphological characteristics used to identify agricultural plants.
- NRS.01.02.01.a. Describe morphological characteristics used to identify trees and other woody plants.
- AS.01.01.02.b. Outline the development of the animal industry and the resulting products, services, and careers.
- CS.01.06.06.a. Describe the value of being a life-long learner and the need for continuous development.
- NS.5-8.3 – Life Science
- NL-ENG.K-12.4 – Communication Skills

Student Learning Objectives

- As a result of this **unit** the students will...
- Discuss the impact of plant science on fiber production.
- As a result of this **lesson** the students will ...
- Identify fiber-based agricultural products.

Content Outline

Objective 1. Identify fiber-based agricultural products

- I. **Fiber-based products are items such as paper, cloth, rope, and twine.**
 - A. Synthetic Fibers: **Synthetic fibers** are produced in factories and are composed of chemical compounds that mimic the characteristics of **natural fibers** created from plants and animals. These include fabrics such as spandex, rayon, nylon, acetate, polyester.

Time

Instruction time for this lesson: 45 minutes.

Resources

Agricultural Marketing Research Center. (2009) Fiber. Retrieved August 25, 2009, from http://www.agmrc.org/commodities_products/fiber/ — Georgia Cotton Commission. (2006). Cotton the Story. Retrieved August 25, 2009, from <http://www.georgiacottoncommission.org/images/E0010401/CottonTheStorySUNBELTFINAL.pdf> — National FFA Organization. (2009). LifeKnowledge Online. Retrieved July 9, 2009, from <http://agedlearning.org> — National FFA Organization. (2003). LifeKnowledge Precepts and Signs of Success.

Tools, Equipment, and Supplies

Overhead projector/transparencies
Sample pieces of:
Paper
Rope
Twine
Fabric Swatches: rayon, cotton, nylon, silk, etc.
MS.PS.3.1.TM.A – one per teacher
MS.PS.3.1.AS.A – one per student
MS.PS.3.1.AS.B – one per student
MS.PS.3.1.ASSESS.A – one per student

Key Terms

The following terms are presented in this lesson and appear in **bold italics**:

Synthetic Fiber

Natural Fiber

Cotton

Forestry

- B. Natural Fibers: **Natural fibers** are those fibers that are produced by plants or animals and harvested for human use as clothing and shelter.
 - 1. Plant Fiber-based Products
 - a. Cotton: Cotton is the world's most popular natural fiber and one of the United States' largest cash crops. **Cotton** is used commonly for t-shirts, denim, towels, and linens. The United States grows more **cotton** than any other country besides China. **Cotton** is grown in large fields in rows. Seeds are planted using mechanical planters. About six weeks after being planted, the **cotton** bush blooms; three weeks later the **cotton** boll forms; and finally, 16 weeks into the season, the boll bursts into the lint (**cotton** balls).



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- b. Wood-based Fiber Products: Trees are an excellent source of fiber in the world. Many things in our everyday lives, such as cardboard, papers, and building supplies, are all tree products. The practice of planting and managing trees is called forestry.
 - c. Natural Twine and Rope: Rope and twine are pieces of fiber that are twisted, wrapped, and knotted together to increase their strength. Rope and twine are commonly constructed from products derived from cotton, hemp, and other plant-based products.
2. Animal Fiber-based Products: Throughout history, humans have relied on animal products for clothing and shelter. Animal-based fibers are still very popular and are often seen as luxurious fibers.
- a. Leather and Fur: Leather and fur are the oldest form of natural fibers in human history. Leather is the skin of animals, and fur is the hair of animals. Common sources of leather and fur are cattle, swine, fox, rabbits, otters, beavers, and coyotes. To produce leather, the hair and flesh is completely scraped from the skin and the hide is cured with chemicals to keep it soft and flexible and to prevent it from rotting. Leather is common in sports balls, clothing such as jackets and pants, and in novelty items such as cowboy hats. Furs are processed while still attached to the leather and are commonly used for their warmth for jackets, coats, scarves, and accessories.
 - b. Silk: Silk is produced by the worm of a particular moth, the Bombyx mori moth. This blind and flightless moth lays about 500 eggs that hatch into silk worms. Then, the worms eat every 30 minutes for about four weeks until they finally spin a silk cocoon. The highest priced silk comes from worms that are fed a strict diet of mulberry leaves. Amazingly, it takes more than 2,000 worms to produce one pound of silk.
 - c. Wool: Wool is harvested mainly from sheep but may also come from goats, llamas, and alpacas. Wool is known for its warmth and texture. Unlike furs and leather, wool can be harvested while the sheep are living. Usually, sheep

are sheared (shearing is the process of removing the wool from the sheep with clippers, like shaving a human's head) once or twice a year. Wool is commonly used in coats, jackets, and accessories such as purses and handbags.

Interest Approach

Before class, make sure you have enough student copies of **MS.PS.3.1.AS.A**; also have a projector and **MS.PS.3.1.TM.A** and **MS.PS.3.1.AS.A** prepared for use. Students will discover the difference between natural and synthetic fibers and learn details about how fiber-based agricultural products are grown, raised, and processed.

Good morning and welcome to another great day of class. Today, we are going to learn about another reason agriculture is so important to us and our families.

First, everyone, take a look at the tag of your shirt. You will notice that the tag will say what your shirt is made of. For example, a t-shirt may have a tag that says it is made of 100% **cotton** or 95% **cotton** and 5% spandex. Record this information on the top of your student activity sheet. I will give you about 30 seconds to accomplish this task. Ready, GO.

After students have successfully recorded the contents of their shirt, encourage them to share this information with their group. Groups would preferably be three to five students at the same table or in close proximity. The groups will then compile a list of all of the different materials of the shirts in their groups.

When I say SHARE, you will share this information with your neighbors. Then, you and your group will compile a list of all of the fabrics that make up everyone's shirt. You will have two minutes to complete this activity before we share these lists with the class. What are your questions? SHARE.

Monitor the class as the students work in groups to complete the task. Ensure that all students are participating and sharing their observations. After two minutes, refocus the students' attention and discuss the activity to create a class list of the materials that comprise everyone's shirt today.

If you can hear me, clap once.

Clap

If you can hear me, clap twice.



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Clap, clap

Great. Now that each group has a complete list of the materials found in their shirts today, let's create a list of all the fabrics we are wearing in the class. We will go around the room and each group will share their list. First, I will tell you that my shirt is made of **cotton** and spandex.

Adjust this response to fit the shirt you are actually wearing today.

Then, continue around the room and allow students to share their group lists. Record this information on the overhead projector, whiteboard, or chalkboard.

Great! We have a pretty extensive list of fabrics right now.

Name off a few examples from the overhead or board.

Would you believe that most of the clothes you wear were grown in fields? Believe it or not, plant and animal fiber products are still the world's most popular source of fabric. Today, we will learn about these fibers, how they are grown, and how they are processed. We will also discover how a few other products you use every day are produced.

Distribute **MS.PS.3.1.AS.A.**

Keep these in mind as we continue. By the end of class, you should have a better idea of how these materials are created and processed before they reach the mall, Wal-Mart, and other stores. What is the benefit of acquiring new knowledge?

What do we gain from learning?

Allow the class to quickly discuss these questions.

Now that we are all motivated to grow and learn something new we will be discussing these fiber-based products listed on the board. Record the information we cover on the paper you are now receiving.

Objective 1. Identify fiber-based agricultural products.

Utilize the *Little Professor e-Moment®*. In this e-Moment students work in pairs. You teach half of the class and then teach the other. After all of the content has been presented, allow the students to teach each other.

In a moment when I say PAIR we will have 40 seconds to find the person in the room with a birthday closest to yours.

Now that we are in pairs decide who will be Professor Einstein and who will be Professor Palleo. Raise your hand if you are Professor Einstein. OK, all of you with your hands up listen closely and take good notes. All of the Professor Palleos, you can do whatever you want at your desk; just remain silent, but you can tune the lesson out.

What questions are there?

Let's get started!

First, we should know that a fiber is not just our clothes; fiber also includes many things we use every day such as: paper, rope, furniture coverings, towels, and certain fashion and household accessories. Even napkins are made of fiber! Now, let's talk about the difference between **natural fibers** and **synthetic fibers**. Are there any ideas?

Allow a few suggestions from the class.

The difference between **natural fibers** and **synthetic fibers** is that **natural fibers** come from plants and animals while **synthetic fibers** are human-made in factories. **Synthetic fibers** are composed of chemical compounds that mimic the characteristics of **natural fibers** created from plants and animals. These include fabrics such as spandex, rayon, nylon, acetate, polyester.

Display **MS.PS.3.1.TM.A.**

Today we will be focusing on **natural fibers** because these are all products of agricultural production. There are two main sources of **natural fibers**: plants and animals. Plant-based fibers are those fibers produced from different parts of plants. Can anyone think of the name of a very common fiber that comes from a plant?

Allow a few seconds for student responses. Take suggestions from the class. Students should respond that cotton is a commonly grown and produced fiber that comes from a plant.

Very good! **Cotton** is the world's most popular **natural fiber** and one of the United States' largest cash crops. **Cotton** is used commonly for t-shirts, denim, towels, and linens.



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The United States grows more **cotton** than any other country besides China. **Cotton** is grown in large fields in rows. Seeds are planted using mechanical planters. About six weeks after being planted, the **cotton** bush blooms; three weeks later the **cotton** boll forms; and finally, 16 weeks into the season, the boll bursts into the lint (**cotton** balls).

Share pictures of cotton growing in fields, before bloom, and in full bloom. If available, pass around a cotton boll and allow the students to feel raw cotton and notice the seeds and stem. This will help students really connect the cotton they are so familiar with to the cotton growing in the fields of the southern United States. You may wish to contact a state cotton commission (such as Georgia Cotton Commission) for free educational materials and resources.

Name some items other than clothing that are made from **cotton**.

Allow a few seconds for students to think about the questions. Then, call on students of your choice. Assist students as they respond to help them come up with cotton products such as towels, cotton swabs, furniture coverings, certain toilet papers, and home decorations such as curtains.

Very good! Thank you for all of your input. Please remember to record this information on the chart on your student activity sheet.

Display **MS.PS.3.1.TM.B** and help the students to fill in part of the information. Then continue by discussing two other examples of plant-based fiber products.

Professor Einsteins, thank you for listening so intently and taking awesome notes; now it is your turn to teach Professor Palleos all you have learned.

Allow three to five minutes for them to relay the information to their partner. Monitor the class to make sure everyone has the correct information.

Now it is time for Professor Palleo to pay attention and take great notes so they can relay the information to Professor Einstein.

Let's talk about two other common types of fabrics that come from plants: tree products and rope. Trees are an excellent source of fiber in the world. Many things in our everyday lives, such as cardboard, papers, and building supplies, are all tree products.

The practice of planting and managing trees is called **forestry**. Rope and twine are pieces of fiber that are twisted, wrapped, and knotted together to increase their strength. Rope and twine are commonly constructed from products derived from **cotton**, hemp, and other plant-based products.

Now that we have discussed plant fiber products, let's discover a few of the common animal-based agricultural products. Throughout history, humans have relied on animal products for clothing and shelter. Animal-based fibers are still very popular and are often seen as luxurious fibers. Can anyone think of a fiber product that comes from animals?

Allow a few minutes to take suggestions from the students.

Great! The three fiber products we will be discussing today are: wool, fur and leather, and silk.

Leather and fur are the oldest form of **natural fibers** in human history. Leather is the skin of animals, and fur is the hair of animals. Common sources of leather and fur are cattle, swine, fox, rabbits, otters, beavers, and coyotes. To produce leather, the hair and flesh is completely scraped from the skin and the hide is cured with chemicals to keep it soft and flexible and to prevent it from rotting. Leather is common in sports balls, clothing such as jackets and pants, and in novelty items such as cowboy hats. Furs are processed while still attached to the leather and is commonly used for their warmth for jackets, coats, scarves, and accessories.

Remember to frequently remind students to keep up with their notes on **MS.PS.3.1.AS.A**.

Now, let's talk about another fiber that comes from animals – wool. Does anyone know where wool comes from?

Allow a few seconds for suggestions from the students.

Great! You are right; wool is harvested mainly from sheep but may also come from goats, llamas, and alpacas. Wool is known for its warmth and texture. Unlike furs and leather, wool can be harvested while the sheep are living. Usually, sheep are sheared (shearing is the process of removing the wool from the sheep with clippers, like shaving a human's head) once or twice a year. Wool is commonly used in coats, jackets, and accessories such as purses and handbags.



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Finally, let's talk about one last animal fiber product – silk. I am so proud that some of you knew where wool comes from. Now, does anyone know where silk comes from?

Allow a few seconds for responses from the students.

Very good! Silk is produced by the worm of a particular moth, the Bombyx mori moth. This blind and flightless moth lays about 500 eggs that hatch into silk worms. Then, the worms eat every 30 minutes for about four weeks until they finally spin a silk cocoon. The highest priced silk comes from worms that are fed a strict diet of mulberry leaves. Amazingly, it takes more than 2,000 worms to produce one pound of silk.

Thanks for listening intently, Professor Paleo! Now it is your turn to teach Professor Einstein. You will have three minutes...Go!

Review/Summary

End the activity with at least five minutes left in the class for a review activity. To review, revisit the list of fabrics on the boards. Allow students to rearrange the list into natural fibers and synthetic fibers. Then they will further divide the natural fibers into plant-based fibers and animal-based fibers.

If you can hear me clap once.

Clap

If you can hear me clap twice.

Clap, clap

Thank you for working so diligently. By now, everyone should have a much better understanding of where their clothes and other fabrics come from and how they are made. Let's take a minute to review what we have learned today.

Looking back at the list of fabrics on the board we made at the beginning of class, which of these are natural fabrics and which are synthetic?

Allow six to ten seconds for students to ponder the questions.

May I have two volunteers come to the board and rearrange the list into two separate columns: **natural fibers** and **synthetic fibers**?

You may wish to take volunteers for this activity or choose two students from the class. Allow the rest of the class to guide these volunteers.

Great job! Now let's think even deeper. What are the two major types of **natural fibers**?

Allow time for student thought before calling on a volunteer.

Great! The two types of **natural fibers** are plant-based and animal-based fiber products. Now let's divide our column of **natural fibers** into two separate columns: animal and plant. May I have two volunteers to do this?

You may wish to take volunteers for this activity or choose two students from the class on your own. Allow the rest of the class to guide the volunteers.

Awesome job, students! Let's take a look at this list.

Quickly list all of the fibers in each category.

Our time is up for class today but I am so proud that we learned so much. From now on, remember each time you slip that favorite **cotton** t-shirt on or slide into those perfect pair of worn out denim jeans, that a farmer worked very hard to grow or raise the fabric that makes your spectacular outfit your favorite!



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Application

Extended classroom activity:

Further study of fiber-based agricultural products can be conducted using **MS.PS.3.1.AS.B**. In this activity, students will draw the outline of their favorite outfit and in the center of the drawing they will describe the source of the fabrics, how these fibers are raised or grown, and then how the raw materials are processed into clothing.

FFA activity:

Students who enjoy this lesson may be interested in the forestry CDE in which forest products are evaluated to determine their potential to provide optimum fiber and lumber products.

SAE activity:

This lesson can be used to introduce the many opportunities students have to pursue a Supervised Agricultural Experience Program in plant science and fiber production. Students may wish to complete an exploratory/research SAE in fiber production by comparing the elasticity of different natural fibers, explore more efficient means of recycling paper products, or research the new technology allowing farmers to grow blue cotton for denim!

Evaluation

MS.PS.3.1.ASSESS.A

Answers to Evaluation

1. D
2. B
3. A
4. C
5. F
6. E



Objective 1. Identify fiber-based agricultural products

Fiber-based products are items such as paper, cloth, rope, and twine.

A. Synthetic Fibers

Synthetic fibers are produced in factories and are composed of chemical compounds that mimic the characteristics of natural fibers created from plants and animals. These include fabrics such as spandex, rayon, nylon, acetate, polyester.

B. Natural Fibers

Natural fibers are those fibers that are produced by plants or animals and harvested for human use as clothing and shelter.

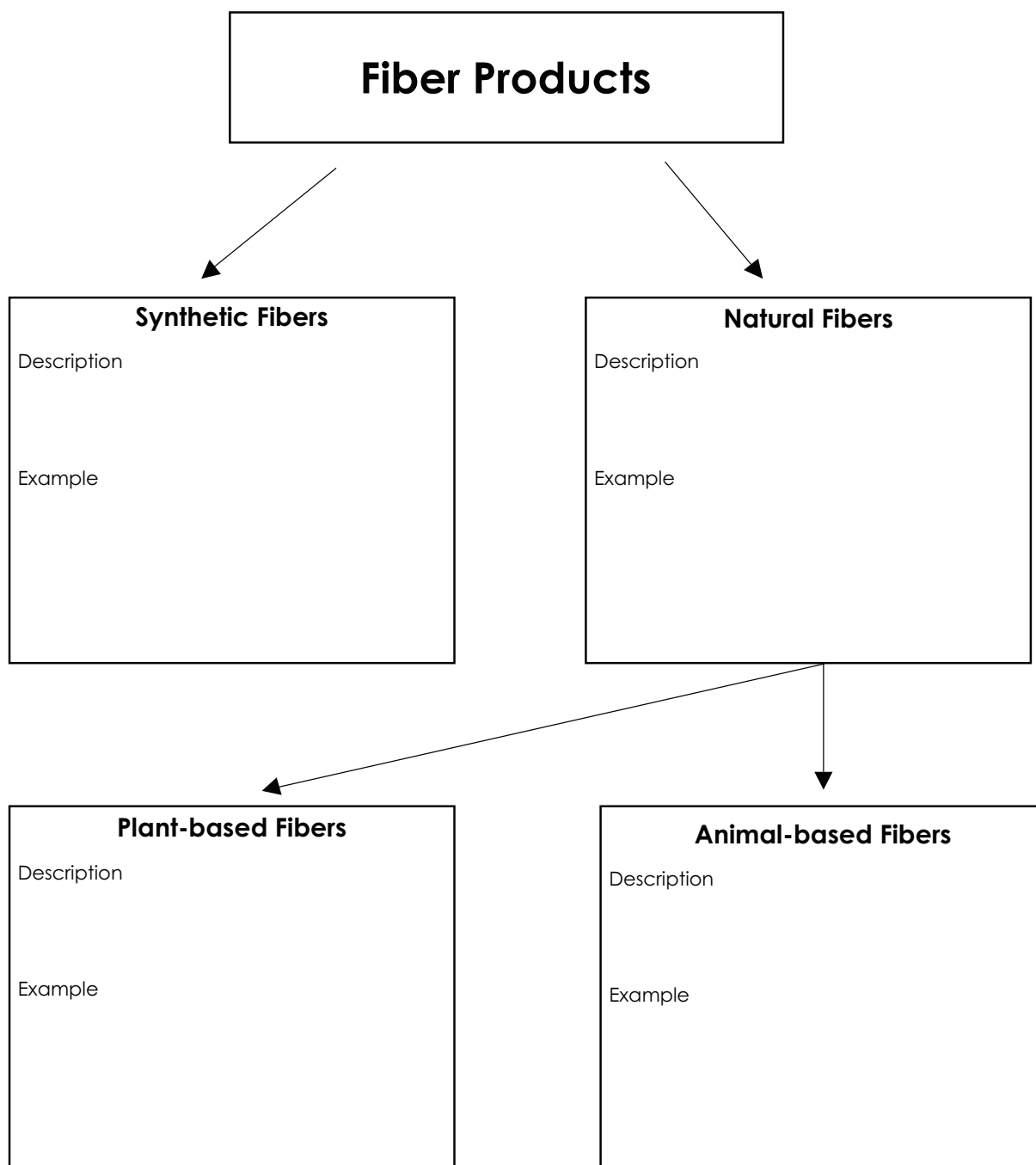
1. Plant Fiber-based Products

- a. **Cotton:** Cotton is the world's most popular natural fiber and one of the United States' largest cash crops. Cotton is used commonly for t-shirts, denim, towels, and linens. The United States grows more cotton than any other country besides China. Cotton is grown in large fields in rows. Seeds are planted using mechanical planters. About six weeks after being planted, the cotton bush blooms; three weeks later the cotton boll forms; and finally, 16 weeks into the season, the boll bursts into the lint (cotton balls).
- b. **Wood-based Fiber Products:** Trees are an excellent source of fiber in the world. Many things in our everyday lives, such as cardboard, papers, and building supplies, are all tree products. The practice of planting and managing trees is called forestry.
- c. **Natural Twine and Rope:** Rope and twine are pieces of fiber that are twisted, wrapped, and knotted together to increase their strength. Rope and twine are commonly constructed from products derived from cotton, hemp, and other plant-based products.

2. **Animal Fiber-based Products:** Throughout history, humans have relied on animal products for clothing and shelter. Animal-based fibers are still very popular and are often seen as luxurious fibers.

- a. **Leather and Fur:** Leather and fur are the oldest form of natural fibers in human history. Leather is the skin of animals, and fur is the hair of animals. Common sources of leather and fur are cattle, swine, fox, rabbits, otters, beavers, and coyotes. To produce leather, the hair and flesh is completely scraped from the skin and the hide is cured with chemicals to keep it soft and flexible and to prevent it from rotting. Leather is common in sports balls, clothing such as jackets and pants, and in novelty items such as cowboy hats. Furs are processed while still attached to the leather and are commonly used for their warmth for jackets, coats, scarves, and accessories.
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- c. **Wool:** Wool is harvested mainly from sheep but may also come from goats, llamas, and alpacas. Wool is known for its warmth and texture. Unlike furs and leather, wool can be harvested while the sheep are living. Usually, sheep are sheared (shearing is the process of removing the wool from the sheep with clippers, like shaving a human's head) once or twice a year. Wool is commonly used in coats, jackets, and accessories such as purses and handbags.

Name: _____





MY FAVORITE OUTFIT

Student Name: _____

Part A:

1. Draw the outline of your favorite outfit below.
2. Then, in the outside of the outline, name the fabric your favorite outfit is made of.
3. Is this fabric natural or artificial?
4. If this is a natural fiber, is it plant or animal based?
5. Describe how this fabric was grown, raised, or processed.
6. Then complete part B.

B. List

Part B: List five other fiber products that are a part of your everyday life. Ex: paper



Name _____

Directions: Match the fabric with the correct source. The first item has been completed for you as an example.

1. Cotton _____D_____

a. Sheep

2. Silk _____

b. Caterpillar larvae

3. Wool _____

c. Lumber

4. Paper _____

d. Bushes grown in fields

5. Spandex _____

e. Animals such as: bear, fox, rabbit

6. Fur _____

f. Chemically produced