NON-PROFIT ORG.
U.S. POSTAGE PAID
RICHMOND, VA
PERMIT NO. 2162

What's Growing On In Virginia?
Virginia Foundation for Agriculture in the Classroom
P.O. Box 27552, Richmond, Virginia 23261

About the Newsletter

What's Growing On In Virginia? is a semiannual publication for Virginia elementary and middle school teachers, published by Agriculture in the Classroom

Program Coordinators: Tammy Maxey, Lynn Stadelmeier
Editorial Staff: Kathy Dixon, Pam Wiley
Graphic Designers: Maria La Lima, Bill Altice
Education Intern: Chelsea Sligh

For additional information and activities, visit our Web site at **AgInTheClass.org** or call **804-290-1141**

What's Growing On In Virginia?

AGRICULTURE IN THE CLASSROOM

FALL 2010 / VOLUME 21 NO. 2

THIS ISSUE

Meat, milk and fibers come from woolly animals

"Baa, baa, black sheep, have you any wool?
Yes, sir! Yes, sir! Three bags full."

This favorite nursery rhyme reminds us that wool comes from sheep, but did you know that other woolly animals also provide fiber? And some give us meat and milk as well.

Certain types of goats, for example, provide meat, and some supply milk. Goat's milk is high in calcium and other nutrients and is believed to be more easily digestible than cow's milk. Goat's milk also is used in skin care products, and goat's milk soap is believed to improve skin, even clearing up acne.

Many ethnic groups regularly eat goat meat, and you can often find it on the menu in Indian restaurants across Virginia.

The wool from Angora goats is used to make mohair, which is softer than regular sheep's wool.

Sheep are sheared annually

Sheep and goats were among the first domesticated animals in the United States. Most of the sheep raised in Virginia are west of the Blue Ridge Mountains.

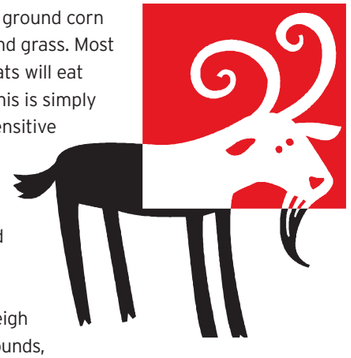
The fiber from sheep is called wool, and the wool of one sheep is called a fleece. Cutting or shaving the wool off of a sheep is called shearing. Shearing doesn't hurt; it's similar to getting a haircut.

Most sheep are sheared with electric shears or shearing machines. Some of the animals are sheared manually with scissors or hand blades. While some farmers shear their own sheep, many hire professional shearers. A professional can shear a sheep in less than 2 minutes and can remove the fleece in one piece.

The world record for shearing sheep is 839 lambs in 9 hours by Rodney Sutton of New Zealand and 720 ewes in 9 hours by Darin Forde of New Zealand.

One sheep produces anywhere from 2 to 30 pounds of wool annually. Sheep are usually sheared once a year, either before lambing or in the spring before the onset of warm weather. Sheep with long fleeces sometimes are sheared twice a year.

Goats produce mohair



Goats eat cracked or ground corn mixed with oats, hay and grass. Most people believe that goats will eat almost anything, and this is simply not true. Goats have sensitive lips, and their natural curiosity gives them a habit of "mouthing" and "smelling" for food that is clean and tasty.

Depending on the breed, female goats weigh between 22 and 220 pounds, and male goats weigh between 27 and 275 pounds and are bigger and shaggier in appearance than females. Male goats have beards that grow longer as they get older. Goats generally live 10 to 12 years.

Goats' eye pupils are rectangular instead of round like those of other animals. Goats have excellent night vision and often will browse for food after dark.

The average Angora goat in the United States yields approximately 5.3 pounds of mohair per shearing and usually is sheared twice a year. Mohair is considered valuable for making plush covering materials where strength, beauty and durability are desired.

Llamas are stronger than horses

Llamas are from the Andes and are accustomed to harsh environments. Therefore, American owners find llamas hardy, healthy, easy to care for and relatively disease-free.

Llamas are environmentally-sensitive animals. Their feet, which are comprised of soft pads with two toenails, affect the environment less than the boots of an average hiker. But llamas are strong, with the ability to carry 25 to 30 percent of their own body weight. They are as strong as, if not stronger than, horses.

Llamas produce wool that is used for clothing, ropes and rugs. They can also be used to guard livestock.

Alpacas produce long-lasting fibers

There are two types of alpacas: the Huacaya, which have crimpy fleece and look like teddy bears; and the Suri, which have fleece that hangs in ringlets down the sides of their bodies. For both types, the lifespan is about 20 years.

Alpacas eat grass and communicate with a series of ear and tail positions and body postures, as well as a humming sound when threatened by predators.

Alpacas were domesticated in the high altitudes of South America thousands of years ago for their luxurious fleece. They have been in the United States since 1984 and, like sheep, goats and llamas, are being raised for their fleece.

Alpacas produce one of the world's finest and most luxurious natural fibers. Soft as cashmere and warmer, lighter and stronger than wool, alpaca fiber comes in more colors than fiber from any other woolly animal. People who own alpaca sweaters will find they last practically forever. Alpaca does not easily tear, pill, stain or create static and is easy to clean.

LESSON PLAN >> ELEMENTARY SCHOOL

SOL:
English: K.1, K.3, K.6, K.8, K.9, K.11, K.12, 1.1, 1.3, 1.8, 1.9, 1.12, 1.13, 2.1, 2.3, 2.8, 2.11, 2.12

Objective:
to define and sequence story elements verbally and in writing, using complete sentences.

Materials:
- goat template
- hole punch
- wool yarn
- glue sticks
- book about a goat such as **The Goat in the Rug** by Charles L. Blood and Martin Link

Download the full lesson at AgInTheClass.org

Agriculture in the Classroom
Achieve • Inspire • Teach • Create
AgInTheClass.org

Every Goat Has a Story

Background Knowledge

There are more than 210 goat breeds worldwide. The majority of goats can be found in Asia and the Middle East. However, goats were brought to the Americas by Christopher Columbus in 1493 and were regularly imported to the United States in the early 1900s. A female goat is called a doe or nanny, and a male goat is called a billy or buck. A baby goat is called a kid. The life expectancy for goats is around 8 to 12 years, and some have lived to be 15.

In Virginia, goats are raised primarily for meat and milk. In 2008, 56,000 goats were raised in Virginia, and in 2009 62,000 were raised. There are other types of goats, such as the Angora, which is raised solely for its fibers. Most Angora goats in the United States are raised in Pennsylvania. The Angora goat is what students will read about in the book **The Goat in the Rug**.

The Goat in the Rug is told from the point-of-view of Geraldine, the goat, and details the process involved in creating a Navajo rug. Readers will learn how mohair is turned into yarn while learning about the cultural practices of Native Americans.

Procedure

1. Read **The Goat in the Rug** to students. Make predictions throughout the story, and discuss various elements of the book with students to get them thinking about the plot, setting and characters. Ask questions about the pictures, and have students relate them to their experiences.
2. Have students write summary sentences using the following key words: first, next, then, after that and finally. If there is time, ask students to write sentences about the actual story elements, such as the characters, setting, plot, beginning, middle, end, problem and solution. You can divide students into groups and assign each group a story element.
3. Have students write on the goat picture and then cut out the goat to share with the class.
4. Once the students have shared their goats, string them together to form a story chain to be displayed in the classroom.

Every Goat Has a Story

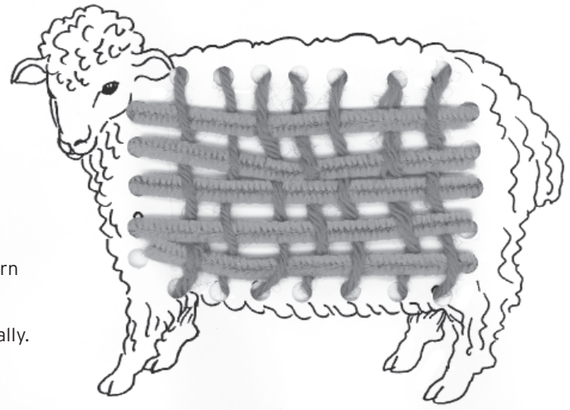
Write one sentence on each goat to summarize the story and its elements.

Download the full lesson at AgInTheClass.org

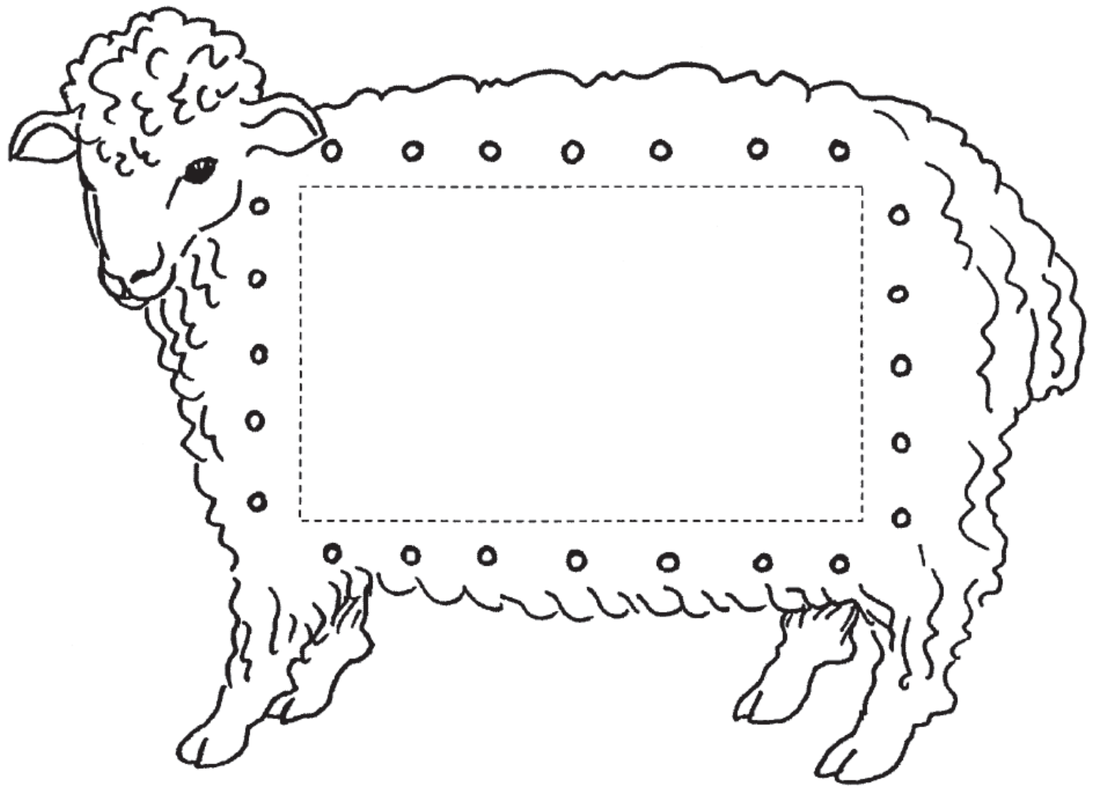
Bonus Activity

Weave Your Own Sheep!

- Copy the template onto cardstock.
- Cut the box out along the dotted lines.
- Use a hole punch to punch out circles on the holes.
- Create your loom by placing either pipe cleaners or yarn horizontally.
- Use the yarn to weave under and over the loom vertically.



This is an example of how the finished sheep should look.



LESSON PLAN >> MIDDLE SCHOOL

SOL:
Science: 6.1, LS.1, LS.13, PS.1

Objective:
to identify the difference between a genotype and phenotype; to match genotypes with phenotypes; to identify the difference between a heterozygous and homozygous genotype; and to use a Punnett square to display generational genes.

Materials:
- worksheet
- sheep and Punnet square templates

Download the full lesson at AgInTheClass.org

Agriculture in the Classroom
Achieve • Inspire • Teach • Create
AgInTheClass.org

Generations of Woolly Genes

Background Knowledge

Throughout history, many animals and plants have been bred for certain traits. Sheep, cows, tomatoes, corn and strawberries are just a few examples of living things that have been selectively bred by humans. Sheep breeders breed animals to produce specific combinations of wool colors, patterns and pigmentations.

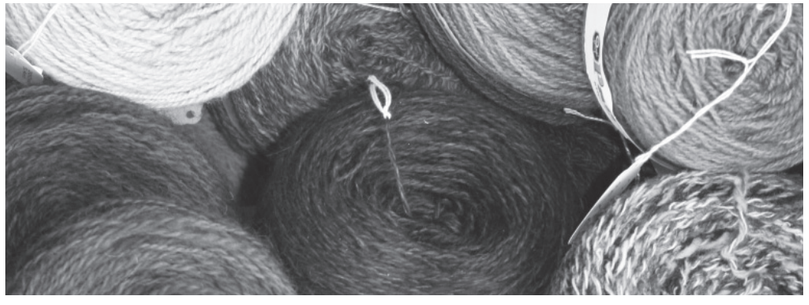
Cells have pairs of chromosomes, and each chromosome in a pair contains genes. These genes are what pass down traits through generations. Chromosomal genes are called alleles, which can be either dominant or recessive. Dominant alleles are expressed with a capital letter while recessive alleles are shown using lower-case letters. If there is a chromosome with a dominant and recessive gene, the dominant gene will always decide the characteristics of the offspring.

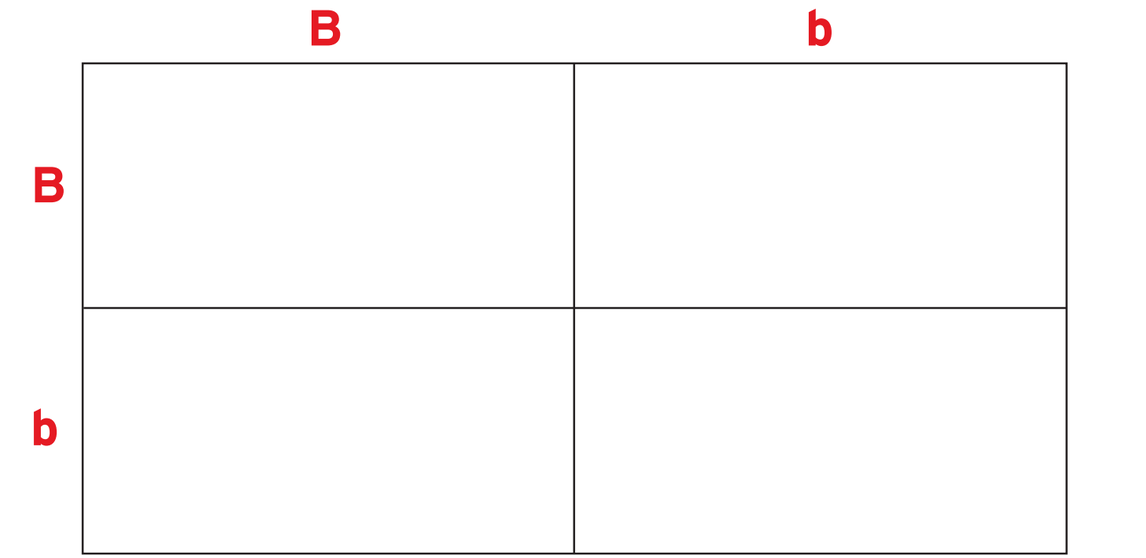
Each parent contributes one half of the genetic makeup of offspring. The offspring's genotype represents the actual genetic makeup, whereas the phenotype determines the physical characteristics of the offspring (Your students will learn more about cells, chromosomes and the details of heredity as they learn about the cells).

In this lesson students will learn about a sheep named Wendy Woolly by exploring her traits and the traits of her friends and family. This lesson includes templates for students to use Punnett squares when determining hair color so that they can better understand the questions on the worksheet. Students can cut out the templates and use them while answering the questions. While answering the questions, students will see how traits are passed on from one generation to the next and will learn the difference between genotypes and phenotypes.

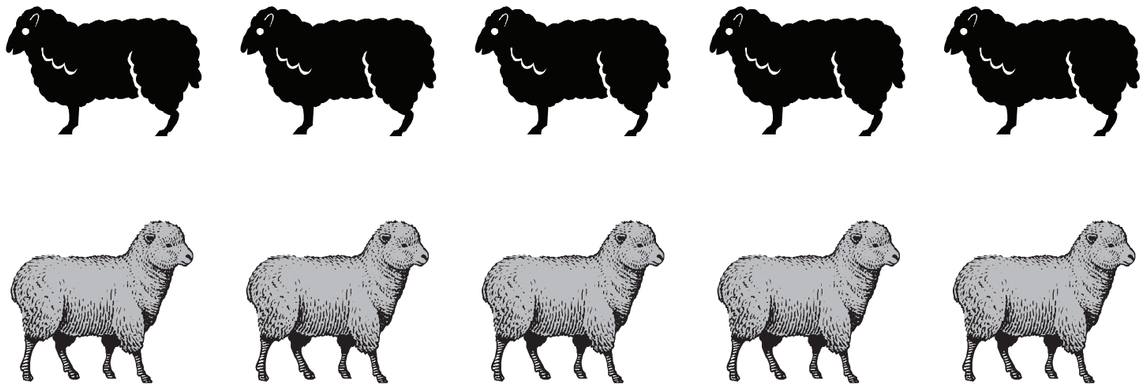
Procedure

1. Thoroughly discuss the information found in the background knowledge so that students are able to understand the activity. Review how to use a Punnett square with genotypes in order to determine the offspring of two people or animals, in this case sheep.
2. Hand out the template for the Punnett square and sheep, and ask students to cut out the templates. Then ask students some practice questions before they start on the worksheet.
3. Explain to students that they are going to answer questions in order to find out more about Wendy Woolly and her family. Tell them to use the templates to answer the questions.
4. Pass out the worksheet, and ask students to use the templates to solve the problems.
5. Review the worksheet once students are done, and answer any questions they may have.
6. Worksheets can be downloaded from the middle school lesson plans at **AgInTheClass.org**, under, "Generations of Woolly Genes."





BB = Homogeneous Dominant **Bb** = Heterogeneous Dominant **bb** = Homogeneous Recessive



Download the full lesson at **AgInTheClass.org**

LITERARY CORNER

Usefulness of woolly animals described in books

Beatrice's Goat, Page McBrier, Simon and Schuster Children's Publishing, ISBN 0689869908

Goats on the Farm, Mari C. Schuh, Capstone Press, ISBN 0736811885

Hooray for Sheep Farming!, Bobbie Kalman, Crabtree Publishing, ISBN 0865056692

Mary had a Little Lamb, Iza Trapani, Charlesbridge Publishing, ISBN 1580890903

Sheep on the Farm, Mari C. Schuh, Capstone Press, ISBN 0736809945

The Goat in the Rug, Charles Blood and Martin Link, Alladin Paperbacks, ISBN 0689714181

The Goat Lady, Jane Bregoli, Tilbury House Publishers, ISBN 088448260

AITC Program Highlights

Sprout success in your classroom

Come join the fun and sprout success in your classroom by attending an AITC professional development workshop.

The following workshops (unless noted otherwise) are for teachers of pre-K through fifth grade and will run from 9 a.m. to 2 p.m. with lunch provided. Participants must pre-register by contacting AITC at **aitc@vafb.com** or 804-290-1141.

- Nov. 2 at the Maymont Nature Center, Richmond
- Nov. 11, 4 p.m. to 6 p.m., King George Citizens Center
- Jan. 13, middle school workshop at Lewis Ginter Botanical Garden, Richmond
- Jan. 14 at Lewis Ginter Botanical Garden
- Jan. 24 at Loudoun Heritage Farm Museum
- Feb. 18 at the Norfolk Botanical Garden

AITC is continually adding workshop dates, so check out AgInTheClass.org for the latest workshops in your area.

AITC is on Facebook

Keep up with all the latest news and resources from AITC by joining us on **Facebook**. You will find upcoming workshops, lesson plans, grant opportunities and more.

Every Goat Has a Story

Standard of Learning
English: K.1, K.3, K.6, K.8, K.9, K.11, K.12, 1.1, 1.3, 1.8, 1.9, 1.12, 1.13, 2.1, 2.3, 2.8, 2.11, 2.12

Objective
The student will be able to:
- Sequence story elements
- Define story elements through verbal and written means
- Write complete sentences

Materials
- Goat template
- Hole punch or tape
- Wool yarn
- *The Goat in the Rug* by Charles L. Blood and Martin Link

Background Knowledge
There are over 210 breeds of goats in the world. The majority of goats can be found in Asia and the Middle East; however, goats were brought over to the United States by Columbus in 1493 and were regularly imported to America in the early 1900's. A female goat is called a doe or nanny, while a male goat is called a buck or billy. A baby goat is called a kid. The natural life expectancy for goats is around 8 to 12 years and in some cases, they have lived to be 15 years of age.

In the state of Virginia, dairy and meat goats are what is primarily raised. In fact, in 2008 56,000 meat and other goats were raised in Virginia, while in 2009 62,000 goats were raised. There are other types of goats, such as the Angora goat that gives us wool or mohair to make fabric; however, in the United States these goats are raised primarily in Pennsylvania. This is the goat that students will read about in the book *The Goat in the Rug*.

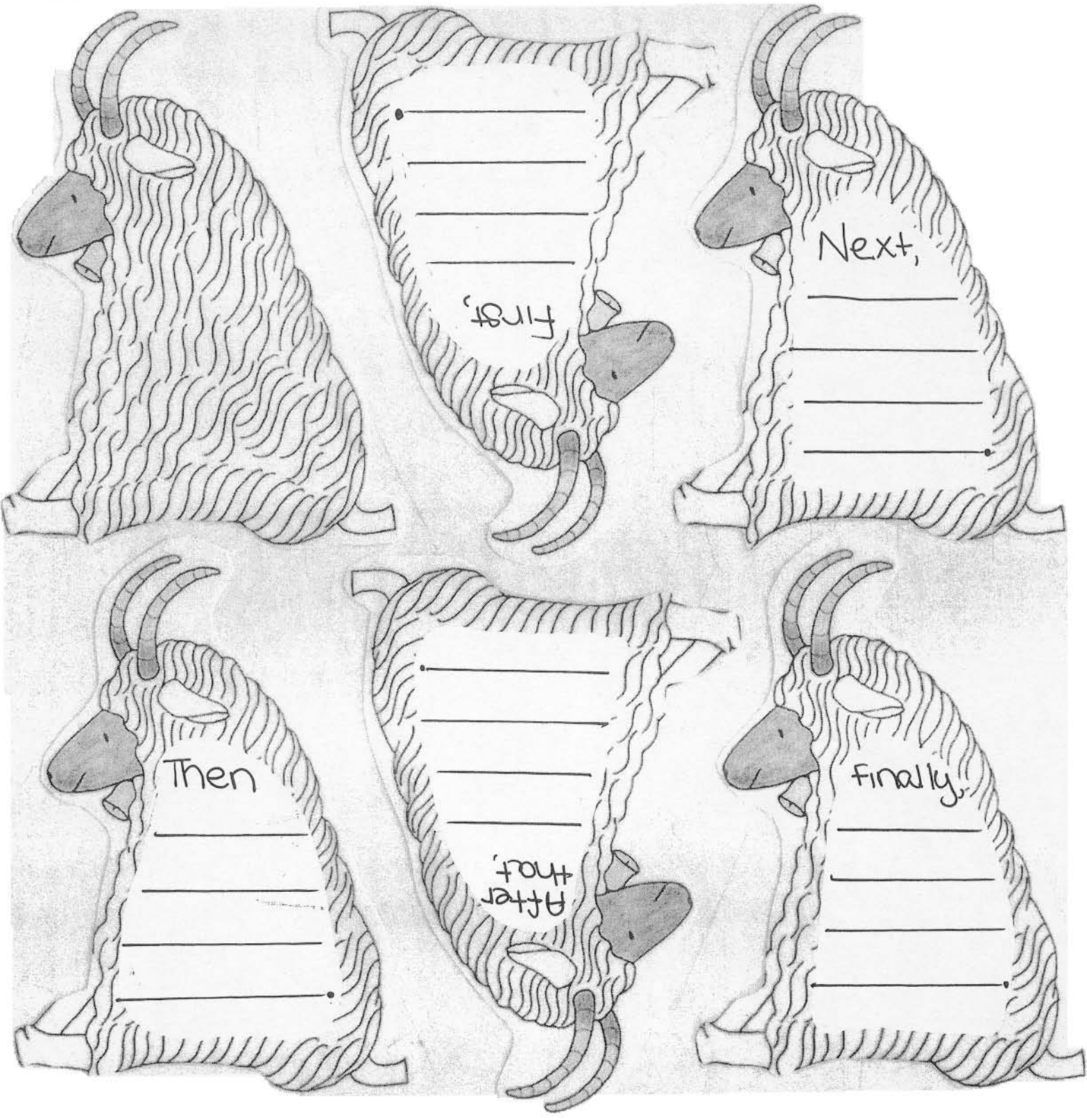
The Goat in the Rug is told from the point of view of Geraldine, the goat, and details the process involved in creating a Navajo rug. Readers will not only learn of how mohair is turned into yarn, but also of the cultural practices of Native Americans.

Procedure
1. Read *The Goat in the Rug* to students. Make predictions throughout the story and discuss various elements of the book with students to get them thinking about the plot, setting, characters, etc. Ask questions about the pictures and relate to student experiences.
2. Have students write summary sentences using the following key words: first, next, then, after that, and finally.
3. Write the sentences on the goat pictures, then cut them out and sequence in the correct order.
4. String them together to form a story chain.

Extension
Instead of sequencing the story, have students identify the story elements such as characters, setting, plot, problem, and solution.

Glenmae's final product is a rug. Have students identify the natural, human, and capital resources involved in creating the rug.

Every Goat Has a Story Template



Generations of Wooly Genes

Standards of Learning
Science: 6.1, LS.1, LS.13, PS.1

Objective
The student will be able to:

- tell and write the difference between a genotype and phenotype
- match genotypes to phenotypes and vice versa
- tell and write the difference between a heterozygous and homozygous genotype
- use a Punnett square to display genes of generations

Materials

- worksheet
- sheep and Punnett square templates

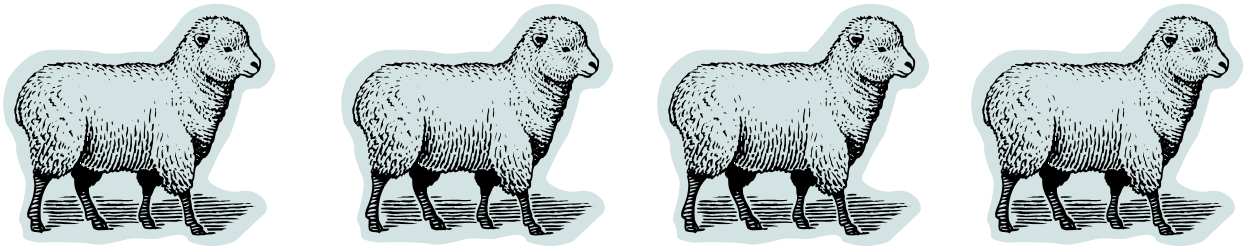
Background Knowledge
Throughout history, many animals and plants have been bred to perpetuate certain traits. Sheep, cows, tomatoes, corn and strawberries are just a few examples of living things that have been selectively bred by humans. Breeders are very aware of the traits sheep carry when it comes to the color of their wooly hair. They try to breed certain colors, pigmentation and patterns together to see what they will come up with.

Cells have pairs of chromosomes and each chromosome in a pair contains genes. These genes are what pass down traits through generations. Genes on the chromosomes are called alleles, which can be either dominant or recessive. Dominant alleles are expressed with a capital letter while recessive alleles are shown using lower case letters. If there is a chromosome with a dominant and recessive gene, the dominant gene will always decide the characteristic for the offspring. Each parent contributes one half of the genetic makeup of offspring. The offspring's genotype represents the actual genetic makeup, whereas the phenotype is the physical characteristics the offspring has. Your students will learn more about cells, chromosomes, and the details of heredity as they learn about the cell.

In this lesson students will learn about a sheep named Wendy Wooly by exploring her traits and the traits of her friends and family. This lesson includes templates for students to use Punnett squares and hair color so that they may better understand the questions on the worksheet. Students can cut out the templates and use them while answering the questions. While answering the questions, students will see how traits are passed on from one generation to the next and will learn the difference between genotypes and phenotypes.

Procedure

1. Thoroughly discuss the information found in the background knowledge so that students are able to understand the activity. Go over how to use a Punnett square with genotypes in order to find out the offspring of two people or animals, in this case, sheep.
2. Hand out the template for the Punnett square and sheep, have them cut out the templates and do some practice questions with them before they start on the worksheet.
3. Explain to students that they are going to answer questions in order to find out more about a sheep named Wendy Wooly and her family. Tell them to use the templates to answer the questions.
4. Pass out the worksheet and have them use the templates to solve the problems.
5. Review the worksheet once students are done to see how they did and answer any questions.
6. Go to www.agintheclass.org under the middle school lesson to download full lesson with worksheet.



Name _____

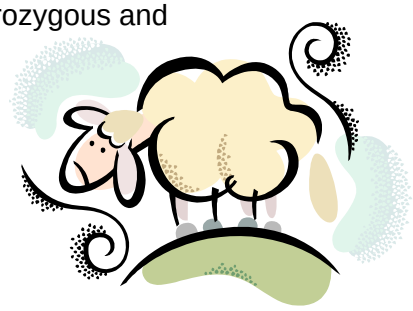
Wool color in sheep is a polygenic trait, meaning it is a trait which is affected by more than one gene. In fact, at least three sets of alleles govern wool color. In this worksheet, only two will be discussed - the pattern pigment color and base color. The lack of pattern pigment will make the sheep wool appear white regardless of base color. A solid pattern pigment will allow the base color to shine through. You will be discovering the wool color genetics for Wendy Wooly, a ewe lamb, and some of the other sheep in her flock.

1. Use the information in the chart below to write the genotype(s) for each color of wool.

Characteristic	Dominant	Recessive
Wool pattern	White (P)	Solid (p)
Wool base color	Black (B)	Brown (b)

(a) White wool _____
(b) Solid wool _____
(c) Black wool _____} dark wool only
(d) Brown wool _____} shows in combination with pattern pigment genotype of _____

2. Use the chart in #1 to answer the questions below. Ewes (female sheep) often have singles or twins, but sometimes have triplets or quadruplets. Wendy Wooly has the only dark wool in her family, out of four lambs. The other three lambs are white. To find out what her parents' phenotypes and genotypes are for the <u>wool pattern pigment gene</u>, use your Punnett square and sheep to try out different scenarios. Use the table above to help you. Write your final result of Wendy's parents and the four lambs in the Punnett square below. Write the genotypes and phenotypes of her parents in the spaces provided. (Hint: Consider heterozygous and homozygous differences)



Ram → _____ _____
Ewe ↓

Phenotype _____

Genotype _____

What is the probability that the lambs will be white? ____ Dark wooled? _____

3. On the farm where she lives, Wendy has a cousin named Walter who is a different color from the other lambs in his family. If his mother (ewe) and father (ram) are both heterozygous black, what is his genotype? Write your final result in the Punnett square to show all the lambs' possible genotypes. (HINT: This time use the <u>wool base color</u> trait.)

RAM → _____ _____
EWE ↓

What is Walter's genotype? _____ ____

What is Walter's phenotype? _____ ____

Is it possible to have another color sheep from Walter's parents? _____

Walter meets a pretty heterozygous black sheep named Wilma. What is her genotype? _____

Complete the Punnett square to show the possibilities that would result if Walter and Wilma had offspring (lambs).

List the possible genotypes and phenotypes for the lambs.

What is the probability of lambs with brown wool? _____%

What is the probability of lambs with black wool? _____%

4. Look back at the Punnett square for #2. What is Wendy's genotype for the wool pattern pigment gene? _____, What are her possible phenotypes?

Wendy meets a heterozygous white ram. Would it be possible for the pair to have an offspring with dark wool? Why or why not? Write your final results in the Punnett square below to answer this question.

RAM → _____ _____ List the possible genotypes and phenotypes for their lamb.

EWE↓

____		
____		

What is the probability that the lamb will have white wool? _____%

What is the probability that the lamb will have dark wool? _____%

What information do you need on Wendy and her mate to determine if the wool is white, brown, or black? _____

5. Wendy's father, Wilbur Wooly, is a heterozygous white sheep, along with his mate, Wanda Wooly. In order for either of their parents (Wendy's grandparents) to have them as heterozygous white lambs, they would have to be what possible pairs of genotypes?

What would their possible pairs of phenotypes have to be? _____

6. Look at BOTH the wool pattern pigment gene and the wool base color gene to answer these questions. Each genotype will have four alleles.
What is the only genotype (both genes) that can produce a brown lamb? _____
What are the two gene combinations (both genes) that can produce a black lamb? _____

What are all of the genotypes (both genes) that a white sheep could have? (HINT: there are six of them!) _____

Why do you think that sheep with colored wool are rarer than sheep with white wool?

ANSWER KEY!!!

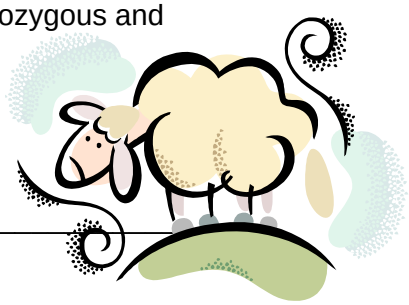
Wool color in sheep is a polygenic trait, meaning it is a trait which is affected by more than one gene. In fact, at least three sets of alleles govern wool color. In this worksheet, only two will be discussed - the pattern pigment color and base color. The lack of pattern pigment will make the sheep wool appear white regardless of base color. A solid pattern pigment will allow the base color to shine through. You will be discovering the wool color genetics for Wendy Wooly, a ewe lamb, and some of the other sheep in her flock.

1. Use the information in the chart below to write the genotype(s) for each color of wool.

Characteristic	Dominant	Recessive
Wool pattern	White (P)	Solid (p)
Wool base color	Black (B)	Brown (b)

(e) White wool **_PP or Pb**
(f) Solid wool **_pp**____
(g) Black wool **_BB or Bb**} dark wool only
(h) Brown wool **_bb**_____} shows in combination with pattern pigment genotype of **_pp_**

2. Use the chart in #1 to answer the questions below. Ewes (female sheep) often have singles or twins, but sometimes have triplets or quadruplets. Wendy Wooly has the only dark wool in her family, out of four lambs. The other three lambs are white. To find out what her parents' phenotypes and genotypes are for the wool pattern pigment gene, use your Punnett square and sheep to try out different scenarios. Use the table above to help you. Write your final result of Wendy's parents and the four lambs in the Punnett square below. Write the genotypes and phenotypes of her parents in the spaces provided. (Hint: Consider heterozygous and homozygous differences)



Ram → **_P**____ **_p**____
Ewe ↓ **Ewe is also Pp**

PP	**Pp**
Pp	**pp**

Phenotype **_White_BOTH RAM AND EWE**_____

Genotype **__Pp**_____

What is the probability that the lambs will be white? **__75%**_____ Dark wooled? **__25%**

3. On the farm where she lives, Wendy has a cousin named Walter who is a different color from the other lambs in his family. If his mother (ewe) and father (ram) are both heterozygous black, what is his genotype? Write your final result in the Punnett square to show all the lambs' possible genotypes. (HINT: This time use the wool base color trait.)

RAM → **__B___** **_b____**
EWE ↓

What is Walter's genotype? **__bb**_____ **_B___**

What is Walter's phenotype? **_brown**_____ **_b___**

BB	**Bb**
Bb	**bb**

Is it possible to have another color sheep from Walter's parents? **__yes- black**_____

Walter meets a pretty heterozygous black sheep named Wilma. What is her genotype? **_Bb___**

Complete the Punnett square to show the possibilities that would result if Walter and Wilma had offspring (lambs). **Walter, ram, is bb and Wilma, ewe, is Bb**

Bb	**Bb**
bb	**bb**

List the possible genotypes and phenotypes for the lambs.
Bb – black lambs and bb – brown lambs
What is the probability of lambs with brown wool? __**50**____%

What is the probability of lambs with black wool? __**50**____%

4. Look back at the Punnett square for #2. What is Wendy's genotype for the wool pattern pigment gene? _**pp**_____, What are her possible phenotypes? **black or brown**

Wendy meets a heterozygous white ram. Would it be possible for the pair to have an offspring with dark wool? Why or why not? Write your final results in the Punnett square below to answer this question. **Yes, because Wendy and the white ram both carry the p allele.**

RAM → **_P____ __p___**

EWE↓

_p__

_p__

Pp	**pp**
Pp	**pp**

List the possible genotypes and phenotypes for their lamb.
Pp – white or pp - dark

What is the probability that the lamb will have white wool? _**50**____%

What is the probability that the lamb will have dark wool? _**50**____%

What information do you need on Wendy and her mate to determine if the wool is white, brown, or black? __**you need to know Wendy's wool base color genotype as well**

5. Wendy's father, Wilbur Wooly, is a heterozygous white sheep, along with his mate, Wanda Wooly. In order for either of their parents (Wendy's grandparents) to have them as heterozygous white lambs, they would have to be what possible pairs of genotypes?
PP x Pp or Pp x Pp or PP x pp

What would their possible pairs of phenotypes have to be? _**white x white or white x dark**

6. Look at BOTH the wool pattern pigment gene and the wool base color gene to answer these questions. Each genotype will have four alleles.

What is the only genotype (both genes) that can produce a brown lamb? __**ppbb**_____

What are the two gene combinations (both genes) that can produce a black lamb?**ppBB or ppBb**
What are all of the genotypes (both genes) that a white sheep could have? (HINT: there are six of them!) _**PPBB or PPBb or PPbb or PpBB or PpBb or Ppbb**

Why do you think that sheep with colored wool are rarer than sheep with white wool? **Because there are SO many more combinations which result in white sheep.**