

Hey, Hey, Hay!

Illinois Agriculture in the Classroom

Companion Guide

To:

Hey, Hey, Hay!

A Tale of Bales and the Machines That Make Them!

By Christy Mihaly

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Hay vs. Straw

Objective Students will understand the difference between hay and straw and be able to answer questions about each.

Learning Standards CCSS.ELA-Literacy.RI.3.1; RI.3.4;RI.3.7; W.3.2

Procedure:

1. Distribute the What is Hay? and What is Stra/w fact sheets (printed below)
2. Answer the questions at the end of each section to gain a better understanding of Hay and Straw.

Hay

Hay is a grass that has been cut, dried, and stored for animal feed. Many kinds of plants can be used as hay, but in the Midwest today, alfalfa and clover are the most common. As Americans moved west onto the Great Plains in the 19th century, they would often use the prairie grasses that were growing there to feed their livestock.

Hay includes legumes such as alfalfa and clover or grasses such as timothy, oat, fescue and bermuda. Most of the time, seeds are still intact in a hay bale.

The Color of Hay

Hay is green, especially when seen next to the more golden hue of straw.

Making Hay

Plants are harvested when alive and usually cut before the seed matures, then dried. Hay bales sometimes have too much moisture content on the inside and can mold (bad for animals) or even burst into flames because heat increases on the inside due to the decomposition process.

Hay Nutritional Value

There are many types of hay used to feed livestock. Some contain more protein and carbohydrates to fuel hard working horses. Specific types of hay are fed to animals depending on their nutritional needs.

Hay Uses

Horses, cattle, sheep, goats and other animals eat hay especially when fresh pasture is not available due to seasonal or access limitations.

What is Hay?

1. **Why do we no longer use prairie grasses like we did in the 19th century?** (The prairie has been tilled and used for crop land or been covered with urbanization.)
2. **What is a legume?** (A plant that has a pod where seeds develop and has nitrogen fixing nodules on the roots.)
3. **Hay can sometimes burst into flames. Explain how a green plant can catch fire.** (answers will vary but should contain information about decomposition.)
4. **Explain how hay would have nutritional value.** (Answers vary, but hay is a grass like, and you may eat grasses like alfalfa sprouts on a sandwich. Hay contains much fiber and could lead to poor digestion in humans.)

STRAW

Straw is a by-product of the grain harvest, e.g., wheat, oats and barley.

The Color of Straw

Straw is yellow or golden in color – many are familiar with straw hats or straw woven baskets.

How Straw is made

The hollow stalks leftover after threshing are dried then formed into bales. Bales of straw have very little moisture content.

Straw Nutritional Value

There isn't much nutritional value in dry straw, therefore it's not usually fed to livestock.

Uses of Straw.

Because it's light and fluffy, it makes a nice bedding for animals. Straw can mulch your plants and keep the soil moist, keeping the top layer from drying out. It can also suppress weeds and it will compost naturally into your garden over time. Did you know straw is used as an ingredient in biofuels, packaging materials and paper manufacturing?

Hay versus straw: Hay and straw are commonly confused. Hay is made from the stems, leaves, and seed heads of plants that are fresh. It is cut and baled when it has the most nutritional value, and is fed to livestock. Straw is also made from the stems and leaves of plants, but is cut after of the plants have been allowed to mature and the seed heads have been harvested for something else. Straw has very little nutritional value, and is best used as bedding for animals.

What is Straw?

1. **On a livestock farm you may find both hay and straw. What are the primary uses for each?** (Hay is feed, straw is bedding)
2. **In the Midwest, why would farmer need to have access to both hay and straw in the winter?** (Straw is an insulator and serves as good bedding, Hay has nutritional value that replaces animals grazing on fresh pasture land.)
3. **If you have equal size bales of straw and hay, which do you think would weigh more? Why?** (Hay may be heavier as it is cut green and has not totally dried down. Straw is made of scraps of dry hollow material. Straw may be lighter.)
4. **What issues do you see with farmers storing both hay and straw?** (Both must be kept dry to protect the integrity of the item. Wet straw will not be good bedding and wet hay can lead to mold issues.)

Word Sort and Draw

Objective: Students will learn new vocabulary words, understand their meaning in text and demonstrate understanding in creative ways.

Learning Standards: CCSS.ELA-Literacy, RI.3.1; RI.3.5; RI.3.7; L.3.4; L.3.5

Procedure:

1. Before Reading “Hey, Hey, Hay” by Christy Mihaly, provide students with the Word Sort Worksheet (next page).
2. Write the following words on the Board.

Bale	Baler
Hay	Hayrake
Livestock	Mower
Native	Tedder
Straw	Switchel
Windrow	

3. Ask students to sort words into the three columns: “Words I Know”, “Words I Think I Know”, “Words I don’t Know”.
4. Incorporate math and graphs into the lesson by tracking where each word appears in each column.
5. Start with the “Words I Think I Know”, and share the following definitions, as each student writes definitions on the back of the worksheet.
6. After all words are defined by the class, ask the class to create a non-linguistic representation of the word (a picture, symbol, etc.) to help explain the word.

Vocabulary defined:

Bale: A bundle of any object, usually agricultural objects can be baled round or square. In addition to cotton, hay, and straw. Department stores ‘bale’ cardboard boxes.

Baler: A machine that packages object into compact and uniform shapes for easy storage.

Hay: A form of forage that can be used to feed animals such as horses, cows, sheep and goats.

Hayrake: A tool that farmers use to gather cut hay and places it into neat windrows.

Livestock: Animals that are raised on a farm.

Mower: A machine that is used to cut grass. Farm mowers are similar to lawn mowers only much larger.

Native: The place where something came into being, or where something is from.
Students could be considered natives of the town in which they live.

Tedder: A machine that picks up and spreads cut hay so it dries quickly and evenly.

Straw: A by-product of grain harvest. Typically the stem of certain grain plants.

Switchel: A drink, sometimes called 'haymakers' punch'. Historically used for thirsty workers to replenish water and salts during hot and humid conditions.

Windrow: Long piles of hay in a field ready to be baled.

7. After sharing the non-linguistic representations of the words, read the book "Hey, Hey, Hay" by Christy Mihaly.

Word Sort Worksheet

Words I Know

Words I Think I Know

Words I Don't Know

Wholly Homophones!

Objective: Students will homophones, understand their meaning, and work to identify homophones.

Learning Standards: CCSS.ELA-Literacy; L.3.4; L.3.5

Procedure:

1. Read the book, “Hey, Hey, Hay!” by Christy Mihaly.
2. Write the words “Hey” and “Hay” on the board.
3. Ask student to define and list the differences between “Hey” and “Hay”
4. Hey is defined as an exclamation or greeting (“Hey You!”) Hay is a form of animal feed made from cut grass, clover or other green plants.
5. Explain that words that sound the same but have different meanings are called homophones.
6. To further expand on the concept of homophones consider watching the following video:

Homophone Monkey at <https://www.youtube.com/watch?v=GJUqJyX5NSA>
7. Pass out Wholly Homophone Worksheet. Ask students to draw a line between the homophones.
8. Ask students to define each word.
9. Follow up activity, ask student to come up with additional homophones and definitions.

Wholly Homophones

Write

Son

Blue

Towed

Aunt

Bite

Dear

Bail

For

Meat

Eight

Brake

Meet

Holy

One

Blew

Bale

Ant

Break

Hear

Byte

Four

Know

Duct

Toad

Ate

Here

Right

Wholly

No

Sun

Won

Duck

Deer

Feed Sack

Objective: Students will understand the dietary needs of horses.

Learning Standards: CCSS Math 5.NBT.5; 5.NF.4; 5.NF.6; 5.NF.7
ELA-Literacy.W.5.;

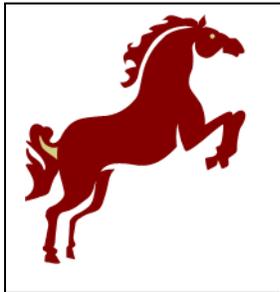
Proper nutrition is important for all animals. Horses eat has demonstrated in the book “Hey, Hey, Hay” by Christy Mihaly.

Materials: (per student)

- | | |
|-----------------------------------|---------------------------|
| -One sandwich size Ziploc® bag | -Yarn |
| -Hershey’s Kisses (use sparingly) | -Corn Nuts (1/4 cup) |
| -Granola (1/2 cup) | -Shredded Wheat (1/2 cup) |
| -Multi-colored Candy (1 tsp.) | -Cheerios (1/2cup) |

Procedure:

1. Copy the Horse Feed Sack chart below and insert the paper into your Ziploc® bag.
2. Add all to the bag, tell a friend what horses eat and how the things in your Ziploc® bag represent what horses eat, then enjoy your feed sack snack!



Horse Feed Sack Chart		
Horses Eat/Drink:	Represented by:	Nutritional Need:
Water	Hershey’s Kisses	Water
Corn	Corn Nuts	Protein/Carbohydrates
Oats	Granola	Protein/Vitamin B
Hay	Shredded Wheat	Protein/Minerals/Vitamins
Sugar Beet Pulp	M & M’s	Carbohydrates
Bran	Cheerios	Protein/Carbohydrates

Additional Reading:

Leah’s Pony
A Field Full of Horses
The Cowboy Horses!

Elizabeth Freidrich	ISBN 1563978288
Peter Hansard	ISBN 0763614343
Chris Demarest	ISBN 07894225092
Gail Gibbons	ISBN 0823418758

Electro-what?

Objective: Understand that exercise is a part of a healthy lifestyle and during prolonged exercise one must maintain proper hydration, replenish electrolytes.

Learning Standards: CCSS.ELA.RL.4.1; RL.4.2; RL.4.7. Math.5.NF.4; 5.NF.6; 5.NF.7

“Now the sun and the wind were hotter and Laura’s legs quivered while she made the trample the hay.....She was thirsty, then she was thirstier, and then she was so thirsty that she could think of nothing else. Nothing was ever so good as that cool wetness going down her throat. Ma had sent them ginger water. She had sweetened the cool well-water with sugar, flavored it with vinegar, and put in plenty of ginger to warm their stomachs so they could drink till they were not thirsty.” *The Long Winter*, Laura Ingalls Wilder 1940

“I will give a traveler a cup of switchel, if he want it; but am I bound to supply him with a sweet taste?” *I and My Chimney*, Herman Melville, 1856

Procedure:

1. Ask students to reflect upon a time when they were hot and thirsty and how they were able to quench their thirst.
2. Compile a list of items that were used to quench their thirst. Discuss the impact of each of the following:
 - a. Water
 - b. Milk
 - c. Soda
 - d. Fruit Juice
 - e. Kool Aid
 - f. Gator Ade
 - g. Flavored Water

Discuss the word electrolyte and the definition of the word.

Electrolytes are present in the human body, and the balance of the electrolytes in our bodies is essential for normal function of our cells and our organs.

Common electrolytes in our bodies include sodium and potassium. In our body Sodium regulates water in our body. Potassium regulates human heartbeat and aids in muscle function. Too much or too little of both of these electrolytes can be dangerous. Electrolytes are lost when people sweat.

Consider the history and reflect up on the passages about switchel above.

Because switchel is made with apple cider vinegar , a rich source of potassium and pure maple syrup (which also contains potassium, as well as calcium, magnesium, and sodium), it’s an all-natural alternative to sugary sports drinks that will help maintain a good electrolyte balance in the body.

Use the recipe for Switchel from “Hey, Hey, Hay” by Christy Mihaly and create your own switchel.

After sampling the switchel, what drink on the market do you find it most comparable?

Switchel Recipe

2 tablespoons apple cider vinegar

4 tablespoons pure maple syrup

1 teaspoon fresh grated ginger

4 cups water

Combine the ingredients in a large jar with a lid and shake. Pour the mixture over ice cubes to serve right away, or chill in refrigerator for a few hours. Stir well before serving. Make approximately one quart.

Research Project

1. Find the price of a retail price of Gator Ade. Determine the price per ounce/cup.
2. Next find the price of a batch of switchel. Determine the price per ounce/cup.
3. Reflect upon which is more affordable and why people are or are not likely to use the more affordable option.

Gatorade Timeline

Summer 1965 - University of Florida Assistant Football Coach Dwayne Douglas approached university physician Dr. Robert Cade, a Renal and Kidney specialist, asking why so many players were impacted by heat and heat related illness.

Fall 1965 - After monitoring the Freshman Football team at University of Florida, Dr. Cade and other physicians found that heat and exercise was an issue with players who were losing sodium and potassium in sweat upsetting delicate body chemistry. The goal was to encourage players to drink water with salt to replace salt they were losing to sweat, and slightly sweetened to raise blood sugar levels, but not enough to upset their stomach. Experiments through the fall 1965 football season showed that players consuming the new drink had more stamina and were able to stay in playing condition in extreme weather conditions

Fall 1966 - "Gator Ade", named after University of Florida Gators, became a staple on the sideline at Florida games.

1967 - University of Florida wins the Orange Bowl football game to a heavily favored Georgia Tech team, outlasting the Georgia Tech Yellow Jackets. The losing Georgia Tech coach credited the 'Gatorade' on the sideline of the University of Florida was the reason his team lost.

1968 - Stokley Van Camp began marketing Gatorade nationwide.

1969 - National Football League Team Kansas City Chiefs are the first NFL Team to use Gatorade on the sidelines.

1983 - Gatorade named the 'Official Sports Drink of NFL'.

1984 - Quaker Oats purchases Gatorade and begins marketing beyond college and professional teams.

1985 - Gatorade Sports Science Institute founded in Barrington, Illinois to conduct scientific research in area of exercise science, hydration and sports nutrition.

1991 - Basketball great Michael Jordan signs with Gatorade as a spokesperson encouraging people to 'Be Like Mike'. Watch original commercial here:

https://www.youtube.com/watch?v=b0AGiq9j_Ak

2001 - Pepsi purchases Quaker Oats and Gatorade, continuing to popularize and market Gatorade.

2015- Gatorade turns 50 years old.

For more information on Gatorade visit:

<http://www.research.ufl.edu/publications/explore/v08n1/gatorade.html>

Charting Hay

Objective: Students will be able to collect, record, and interpret data. Students will learn to construct bar and picture graphs for data they collect.

Learning Standards: Math.3.MD.2.3

Procedure:

1. Explain to students that they are going to learn about representing **data**, or information.
2. Ask your students to give an example of a time when they had to collect and use data.
3. Collect data from your students by asking them to say what they brought for lunch or are planning to have for lunch. Write this on the board in categories. For example, the categories could be salad, sandwich, pizza, and other.
4. Display the lunch count data on the board.
5. Ask a volunteer to set up a **picture graph**, or a visual representation of data with pictures, and a **bar graph**, or a visual representation of data with rectangles that represent numbers, on the board.
6. Explain that numbers are usually on the vertical side (**Y axis**), and what is being measured is usually on the horizontal side (**X axis**). For example, in the lunch data graph, food would be on the X axis, and number of people that brought that food would be on the Y axis.
7. Invite someone to illustrate the lunch data on a bar graph. Have her use a different colored marker for each item, such as green for salad and yellow for pizza.
8. Ask your students questions about the graph. Potential guiding questions include: *What do you think is a favorite food among our class? Least favorite? How many more people want salad compared to pizza? How many fewer people want sandwiches compared to pizza?*
9. Then, invite another volunteer to represent the data on a picture graph. Explain that for this picture graph, each picture will represent 2 food items.
10. Remind your students how to count by twos, and explain that 2 pictures of pizzas represent 4 pizzas.
11. Explain to your students that a half picture represents one item.

Utilize the graph representing Illinois hay harvest statistics and convert this into a bar graph and a line graph.

Consider using Excel to showcase the use of technology in interpreting bar and line graphs.

Illinois Hay

Year	Acres of hay planted	Total Production in tons
1950	2,840,000	4,648,000
1960	2,171,000	4,682,000
1970	1,230,000	3,303,000
1980	1,160,000	3,558,000
1990	900,000	3,448,000
1997	970,000	3,159,000
2000	830,000	2,594,000
2007	610,000	2,001,000
2017	490,000	1,626,000

<https://www2.illinois.gov/sites/agr/About/History/Pages/Crop-History.aspx>

After creating the graphs, have student write a summary and prediction of the future of hay acres and production in Illinois. Be sure to include the uses of hay in Illinois and the importance of hay, as well as the implications this could have on individual students.

Where's the Hay?

An original lesson by Ashley Ritter

Objective: Students will explain basic concept of hay and accurately test the playground soil for nitrogen, phosphorus, and potassium

Learning Standards: NGSS 3LS 1-1; 3LS 3-2

Materials needed:

Teacher created poster
Examples of hay
Examples of nitrogen, phosphorous, potassium fertilizers
4 Luster Leaf 1601 Rapitest Soil Test kits
Gardening Shovel
Sealed containers to collect soil
2 gallons distilled water
Pipets
Results/Recommendation worksheet
Video explaining testing process: <https://www.youtube.com/watch?v=o78MB7R4EbE>
Map of the playground
Numbered flags to put in the ground marking where students will test
One cup measurement tools
Rulers

Procedure:

Day One

- To begin the unit, the teacher will first explain that the class will go out in the field and be completing first hand with what they are about to learn.
- Students will complete a true/false knowledge sheet before beginning the lesson.
- The teacher will cover all basic concepts from the poster board such as: what is hay, uses, types, way to bale, soil composition, field testing, and nutrients needed.
- As the teacher is explaining, students will follow along on their paper checking their answers to the questions. Prior to beginning the soil testing, students will answer, "Why is it important to test soil?"
- The teacher will play the video on YouTube explaining the soil test.

Day Two

- Review the material from the prior day.
- Put students into groups, to gather materials to complete the soil tests;
 - Assign jobs:
 - Soil digger
 - Ruler measurer
 - Water filler
 - Soil shakers
 - Nitrogen tester
 - Phosphorous tester
 - Potassium tester
- Teacher assigns the area/flag number to the groups.
- Groups dig holes 7 inches deep in their area and fill the sealable container with 1 coup of soil.
- Add 5 cups of distilled water to the soil and shake
- Allow to rest overnight.

Day Three

- Review process and purpose for testing soil.
- Students complete three soil tests and fill out the graphing chart with the results.
- Students write down what nutrients are needed in each area.
- As a group, discuss results and map the nutrient needs throughout the field.
- Students will discuss results with school facilities and grounds managers and suggest fertilizer strategies.

Group Names: _____

Date Sample Taken: _____

Area Number of Sample: _____

Job Assignments

Soil Digger: _____

Ruler Measurer: _____

Water Filler: _____

Soil Shaker: _____

Nitrogen Tester: _____

Phosphorous Tester: _____

Potassium Tester: _____

Results

Surplus			
Sufficient			
Adequate			
Deficient			
Depleted			
	Nitrogen	Phosphorus	Potassium

Recommendations: _____

Name: _____

Date: _____

True or False?

Question	Pre Test	Post Test
Hay is cut, dried grass.		
Animals sleep on hay.		
There are many types of hay.		
Hay can only be baled in the shape of a rectangle.		
You cannot test to see what is in soil.		
The top three nutrients in soil are nitrogen, phosphorus and potassium.		
Nitrogen is the most important nutrient in soil.		
Phosphorus helps the plant grow better flowers and seeds.		
Potassium helps plants stay alive in a drought.		
There is nothing you can do if your soil is missing nutrients.		

Why is it important for farmers to fertilize their fields?

For more information visit. www.cropnutritionc.com/efu-plant-analysis

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