"Why Grow Corn on the Farm?": A Supplemental science program for J.B. Mahaffie Had a Farm grades 6-8.

Back ground: Read this excerpt taken from http://corn.agronomy.wisc.edu/Management/L011.aspx below in order to answer the questions following this section.

"…The corn plant is one of nature's most amazing energy storing devices. It does this by producing a large efficient energy "factory" - the plant with its roots, leaves, stalk, and flowering parts - and then by capturing the sun's energy and storing large amounts of this energy in the grain, in a chemical form (largely starch) that can be used as an energy source by animals.

The corn we cultivate today came from many sources. There were the Aztecs of the Mexican plateau, the Mayas of the Yucatan-Guatemala region, and the Incas in Peru. Native Americans were the first successful corn breeders of North America. They developed all the varieties except POD and WAXY corns. Indians of Jamestown, VA showed colonists how to grow corn. Corn was introduced into Europe from the Americas and spread worldwide…"

Discussion:

1. What part of the plant stores the energy from the sun?
2. Is this energy in the form of a protein, starch, or sugar?
3. List the people who are credited with the origin of corn as a crop.

Further study:

The Legend of the Three Sisters may be used to interface with Language Arts and shows interdependence for team building.
http://www.ncdcr.gov/Portals/7/Collateral/Database/F05.legend.three.sisters.pdf

- What three plants are considered "The Three Sisters"?
- How was each plant important to the success of the other two plants in the group?

"**Bloody Butcher Corn": A Genetic Studies at Mahaffie Stagecoach Stop and Farm –A genetics study for Grade 6-8**

Background: There are several local examples of genetics that can be studied at Mahaffie Stagecoach Stop and Farm. J.B. Mahaffie planted Bloody Butcher corn, and raised Durham cattle, and Cochin chickens. These are now considered heirloom species, but at the time were very common, even popular breeds. J. B. was known to have been a judge at the Johnson County Fair and had a good eye for selecting goo breeding stock. One of the heirloom plants is Bloody Butcher corn. J.B. Mahaffie used Bloody Butcher corn as supplemental feed source to help them get through the long Kansas winters. It would be helpful if students already have a strong background in how a Punnett square is used to predict outcomes in offspring traits, but accommodations have been made for those without prior experience. This first activity is intended for use before you come to visit the farm. When you come to visit, a lab kit will be given to you to use as a follow up activity.

Key terms: Punnett square, homozygous, heterozygous, hybrid, dominant, recessive

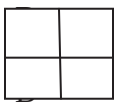
Next Generation Science Standards covered in this activity:

- MS-LS3-2: Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

Lab Activity:

1. Materials for each lab group: ½ sheet of colored construction paper, and one pair of scissors
2. Procedure:
    a. Mimic asexual reproduction:
        i. Have one student cut the paper in half, have another cut both halves in half, keep cutting paper in half until you have confetti.
        ii. This is like asexual reproduction. The offspring have the same color as the original one parent. (no variation) Throw away the confetti.
    b. In sexual reproduction the offspring sometimes have one parent's trait, sometimes the others, and sometimes have a blending of the two as in incomplete dominance.
        i. Complete the Punnett Square below to determine the possible offspring traits. Capital B represents Brown eyes, which is dominant, while a lower case "b" represents blue eyes, and will be recessive.

B b



3. Questions:
    1. How many offspring are likely to have blue eyes?
    2. How many are likely to have brown eyes?
    3. How many will be a heterozygous, (hybrid) Bb, and what color eyes will they have?
    4. How many will be a homozygous BB, and will they have blue or brown eyes?
    5. How many will be a homozygous bb, and will they have blue or brown eyes?
4. Write a 2-3 sentence summary of what you have learned: _____

_____

_____

_____

_____

Post Visit Activities:

(include case studies of genetics of Bloody Butcher corn, polled vs. horned Durham cattle, and colors of Cochin chickens.)

Bloody Butcher corn

Background: In corn plants, the kernels are the female part, the egg, and the tassel part contains pollen, the male part. When pollen is blown by the wind or carried by insects, it travels through the corn silk tubes and fertilizes the kernel. You have probably opened an ear or two of corn to see that not all the kernels have developed. Those kernels never got fertilized. Because corn reproduces sexually, variation is very possible in offspring. The best example of this variation is the harvest corn (Indian corn) that is commonly used to decorate in the fall.

Indian corn

Bloody Butcher corn from Mahaffie

Directions:

1. Remove the index card with the Punnett square on it from the bag and place it on the table.
2. Place one red corn kernel beside each capital R on the outside of the Punnett square. Place a yellow kernel for the lower case "y".
3. Now place either one red or one yellow corn kernel *inside* the boxes to represent the trait from each parent being inherited. (If there is a red kernel in the box, as well as a yellow kernel, it will be red in color, but have a recessive gene for yellow.)
4. Complete the Punnett Square below by adding the kernels for a first year: Ry x RR cross:

	R	y
R		
R		

1. What are all the possible genotypes of offspring? _____
2. What are all the possible phenotypes for the offspring? _____

B. And for a second year: a R y x R y cross….

	R	y
R		
y		

1. What are all the possible genotypes for the offspring? _____
2. What are all the possible phenotypes for the offspring? _____
3. How many of each genotype would you predict? _____
4. How many of each phonotype would you predict? _____

Discussion:

1. What would the corn look like in *five* years if you continued to use the seeds from the offspring of the previous year?
2. How would farmers get a *purely* yellow strain of corn (our present day yellow sweet corn)?
3. How would they get a *purely* red strain of corn (Bloody Butcher corn)?
4. Refer back to the Lab Activity, 2A. Why does asexual reproduction result in no variation (except in the case of mutations)?
5. Discuss the advantages of "biogenetic diversity".
6. **Further study on Adaptations:** What characteristics of Bloody Butcher corn make it well adapted for thriving in Kansas? **Next Generation Science Standard covered by further study**: LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.