

Lesson Plan

Date Draft Submitted: 2/15/2010

Lesson Title: Peanut Butter Broccoli

Grade Level: 5th

Subject Area: Plant Breeding and Genetics, Nutrition

Setting: Classroom and Garden or prepared classroom plants

Instructional Time: 1 hour

Grade Level Expectation:

L.HE.05.11 Explain how the traits of an individual are influenced by both the environment and the genetics of the individual.

L.HE.05.12 Distinguish between inherited and acquired traits.

B5.3f Demonstrate and explain how biotechnology can improve a population and species.

3 MNN Behavioral Outcome

- Eat fruits and vegetables, whole grains, and fat-free or low-fat milk products every day.
- Be physically active every day as part of a healthy lifestyle.
- Balance caloric intake from food and beverages with calories expended.

SNAP-Ed Core Nutrition Messages:

Want your kids to reach for a healthy snack? Make sure fruits and veggies are in reach.

Eat smart to play hard. Eat fruits and veggies at meals and snacks.

Type of garden setting: Classroom and Wonder Wall, Greenhouse

Goal: Students will use the garden or other plants available to recognize physical traits that differ among the plants. This data will be collected and a class graph created using the Wonder Wall. After examining plant and nutrition characteristics, students will create new produce items by “crossing” plants that they already eat and selecting for a plant that will be nutritionally good for them and taste good!

Learning Objectives:

Students will observe different physical traits among plants in the garden.

Students will experience plant breeding and genetics through the “crosses” they create.

Students will be able to describe the nutritional benefits in the plants they create and the advantages of growing and eating these new plants.

Background:

Traditional plant breeding and biotechnology are used to create fruits and vegetables that consumers prefer, are resistant to diseases and grow better under poor conditions. People have been doing plant breeding and selection for a very long time. Selective breeding starts with identifying desirable traits in a plant (or animal) and then breeding those plants to produce offspring with the desirable traits. Traits from different types of plants (within limits) can also be combined to form a new plant, such as broccoflower (broccoli and cauliflower combined) or pluimcots (plum and apricot combined). This process usually takes many generations of breeding and selecting before you get the desired traits in all of the offspring.

Genetic engineering, sometimes called biotechnology, is the process of adding, removing, or transferring genetic material from one organism to another. Genetic engineering is exciting because it has the potential to create specific desirable traits in an organism. However, it is a complex process with limitations and should not be used without careful thought, planning and evaluation of possible complications. Scientists and biotechnology companies need to consider the ethics, costs, potential benefits and possible drawbacks of genetic engineering.

There is controversy around the world about the benefits and drawbacks of genetically engineered foods. Research on genetic engineering will continue, and it must be accompanied with open discussion about the benefits and drawbacks. Be sure to share recent related news articles with your students. Be sure to look carefully at the authors of any articles and try to determine if they have a specific agenda they are promoting.

This activity, *Peanut Butter Broccoli*, encourages students to use their imagination in designing a new produce item. How can the students improve the food they like to eat? Can they combine foods from two different MyPyramid food groups to make a new combination food? How can they make the foods they do not like to eat more appealing? Is it even theoretically possible to produce the food the students have created? These topics can be addressed in this fun activity.

Vocabulary:

Inherited trait: A characteristic that is passed to its offspring from the genes of the parents.

Plant breeding and genetics: Purposefully altering or crossing a plant using its heritable traits to create a new plant with the desired traits.

Advanced Preparation:

- Set up the Wonder Wall for creating the class graph.

- Select plants for trait recognition within garden
- (If possible) Have genetically a engineered plant ready for display, for example the Broccoflower (broccoli and cauliflower)

Supplies:

- Paper and coloring supplies for creating new produce item.
- Garden, Greenhouse or sample plants
- Wonder Wall access within the classroom

Safety notes: none

Procedures:

Step 1: To introduce the concept of physical traits and inheritance, collect information from the class about a certain physical trait (i.e. how many students have black hair, how many have blond hair, blue eyes, green, brown, etc.). Point out the difference between inherited traits and traits that result from changes over time (such as gray hair) or from outside sources (hair dye). Compare similarities and differences.

Step 2: Have students create a graph of one of their own physical traits that each student can contribute to (eye color, hair color). Have the students log in and post on the Wonder Wall to contribute their data and construct the graph of that data.

Step 3: Review the idea of physical traits and that they are inherited from your parents. Discuss that just as people have traits, so do plants and garden produce items. Explain how plants are bred by scientists to create new healthier and tastier options all the time. Give examples or show the prepared produce item(s) (example; crab apple vs. big red apple, tomatoes in various sizes).

Step 4: Break the students into groups of 3 to 4 students. As a class, make a list of plant and produce traits they will analyze. If using lettuce, some traits may include leaf shape, color, head shape, taste, and leaf size.

Step 5: Take students to the garden (or greenhouse) or use produce in the classroom and ask them to write down a distinct physical trait that defines the plants within a species from one another. Have them enter this data into the Wonder Wall and construct a class graph from this data. Allow the students time to discuss the results presented in both of the graphs.

Step 6: In small groups, have the students brainstorm different fun imaginary produce items that they would like to eat. Have them select one food item for taste and another for nutrition. Now imagine crossing these plants to produce a new food.

- Have the students decide where the desired traits will come from (i.e. another plant, bacteria, animal, eggs, etc.)
- Explain the concepts of selective breeding and genetic engineering. Have students decide whether the item can possibly be selectively bred or must be genetically

engineered. You may need to help them with this. If you are uncertain, chances are the item must be genetically engineered.

Step 7: Have the students draw a picture of their new genetically engineered food. List the important characteristics of this new food that that will make it popular with their friends and with their parents.

Assessment:

Participation with the Wonder Wall - creating graphs of traits.

Creativity in creating a new food.

Does this plant accurately represent traits found in the parent cross?

Would this cross even be possible?

Answer Key:

Answer varies

Student Pages:

Visual Aid Drafts/Suggestions:

Differentiated Instruction & Extensions:

Teachers may extend the lesson with more discussion of plant breeding and genetics concepts. They may ask the students to write responses to what they have seen and heard.

Strategies for Below-Level Readers:

- Students may demonstrate their plant cross with pictures they've drawn instead of the listed traits and short paragraph.

Strategies for Above-Level Readers (50-100 words)

- Have students write 50-100 words discussing their created food and have them read to share it with the class.

Extension Ideas

- Teacher may extend the lesson by allowing the students discussion time in small groups regarding their genetically modified food. Children can be prompted to share the two plants he or she chose to breed and why, as well as discussing which traits will be seen from either.
- Have the students try to pick out which traits are dominant versus recessive on the prepared plants. Pick out ratios for how often these traits are seen

- Compare nutritional labels on various foods we eat today. Discuss what to look for when choosing to eat healthy

Supporting Resources

Teacher Resources

Literature

Websites Original Lesson plan (pg. 29) <http://www.cfaitc.org/LessonPlans/pdf/408.pdf>

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