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INTRODUCTION TO PLANT DOMESTICATION – LESSON PLAN / OVERVIEW

Difficulty Level: Advanced middle school to high school students

Learning Goals:

- Understand that modern crops were domesticated 10,000 years ago
- List the traits generally involved in domestication syndrome and identify why they were beneficial to ancient farmers
- Apply knowledge on domestication to a plant that is undomesticated today

Anticipatory Set: Domestication and Adaptation Game – Seed Dispersal

Material needed:

- A deck of cards for each group (4-5 students/group)
    - Small cut up pieces of scrap paper will work as well
- Paper clips
- Tape
- Small objects (i.e. beads, beans)
- Hairdryer

Instructions:

- Divide classroom into groups of 4-5 students, can be larger if needed.
- Instruct students that they are acting as plants and need to get their "seeds" (sheet of paper) to disperse as far as possible.
- They will have 5-10 minutes and access to any of the above supplies to modify their seeds.
- Once the 5-10 minutes are up, one group member is to hold out his or her hands flat with the paper in them. The instructor will then take the hairdyer and blow the paper out of the student's hands. Whoever has the paper go the farthest wins!
- PLOT TWIST! (Round Two)
- A farmer now has to harvest the seeds for food! He or she doesn't want to spend time collecting seeds off the ground. This time, groups need to figure out ways to stop their seeds from blowing away!
- Groups have 5-10 minutes to use any of the supplies to keep their seeds from blowing away. The group with the most seeds left in the end wins!
    - (Note: groups are not allowed to hold onto the paper when the hairdryer is used. However, there is nothing to stop them from taping the paper to their hands!)

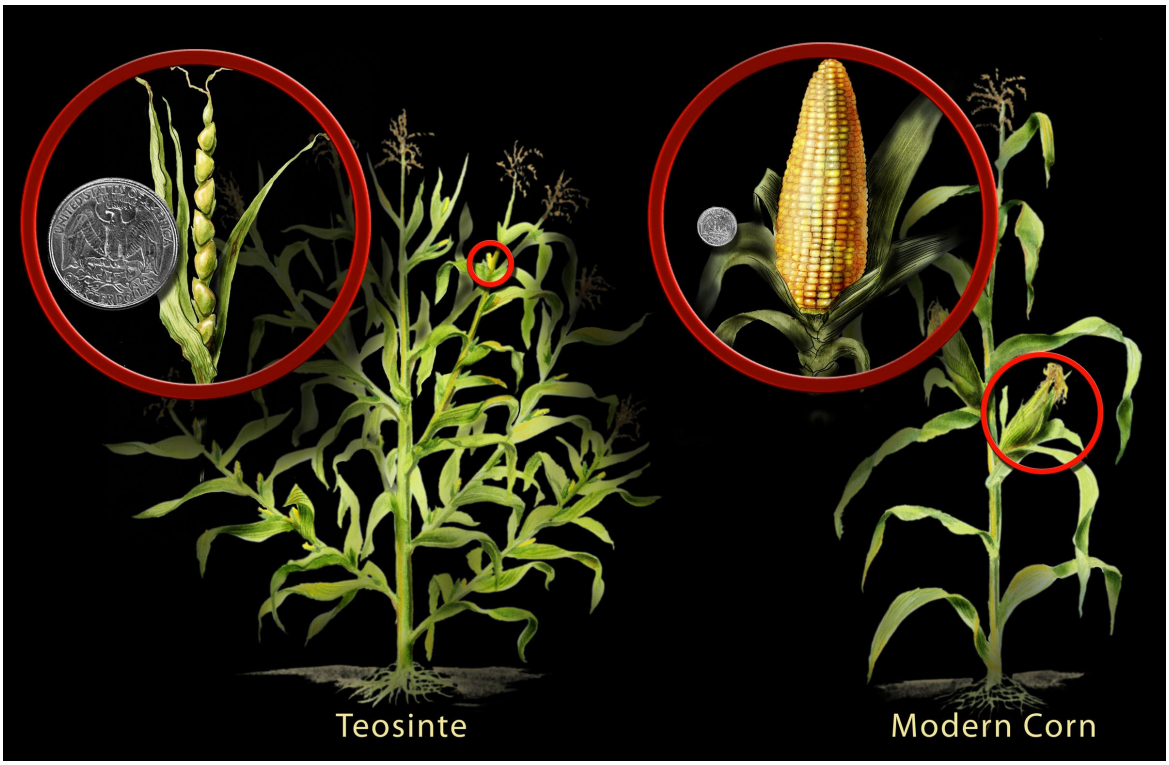
Lesson outline:

Many of the major crops that we rely on today were domesticated 10,000 years ago by ancient farmers around the world. These ancient plants are called "crop wild relatives" and in many cases, can still be found out in nature. Crop wild relatives look completely different than the modern crops that we see in the supermarket today. This is because ancient farmers selected on traits that made the crop wild relatives more suitable for agriculture. Over time, crops began to look more like modern plants.

Let's consider corn, referred to as maize in the rest of the world. Maize (Zea mays ssp. mays) was domesticated in the central Balsas of Mexico from its wild ancestor teosinte. Maize today looks almost nothing like teosinte!

ACTIVITY 1: *What do you think teosinte looks like? Draw or describe it on a sheet of paper.*

- Have students draw or describe what they think a wild maize plant may look like. Allow 5-10 minutes. This can be done as a group or individually. At the end, have students share their ideas. Then, show a picture of teosinte.



(Nicolle Rager Fuller, National Science Foundation)

Here is what teosinte looks like compared to maize. How close was your drawing?

- Discuss with students the differences between their plants, and why teosinte's traits may help it survive in the wild.

Teosinte is a large and bushy plant, with several lateral branches coming off of the main stalk. Each branch ends in a male inflorescence, or flower, called a tassel. Additionally, several small ears can be found along each branch, meaning that each plant can have dozens of ears. These ears are tiny. They have a single row of kernels surrounded by a hard fruitcase. Finally, the teosinte can put out multiple tillers, which is like having multiple stalks.

ACTIVITY 2: *What traits do you think ancient farmers selected upon in teosinte? Why would these be desirable?*

- Discuss with students the further differences between teosinte and maize. Have them brainstorm what ancient farmers might have selected upon based on these differences. Encourage them to further extend their ideas by brainstorming why the farmers might have found those traits to be desirable.

As we domesticated maize, we selected upon certain traits that traditionally made harvesting easier and plant yield higher. However, these traits are detrimental to plants in the wild, as they are unable to disperse their seeds. This is a phenomenon that we call domestication syndrome. Traits that farmers selected upon include loss of seed shattering, increased seed size, less branching of the plant, and changes to flowering time.

ACTIVITY 3: *What is the importance of each of these traits to domestication and modern crops?*

- Have each group select one of four domestication traits to look up. Then, have them share their findings with the entire class. They should be able to communicate the importance of that trait, and how it could negatively affect the wild plant.
  - Example domestication traits:
    - Loss of shattering
    - Seed size
    - Less branching
    - Flowering time

Now that we've learned about domestication and the traits that ancient farmers selected for, how would you domesticate a wild plant today?

APPLICATION ACTIVITY: *If you could domesticate any plant now, what traits would you select for?*

- In groups, have students pick any plant that is currently not grown in an agricultural setting. Have them come up with a target purpose for domestication (food, fuel, fiber, or feed for animals) and systematically decide what traits they would want to change on their plant.

FURTHER CLASSROOM AND PROJECT IDEAS:

- Many scientists are trying to domesticate wild plants today! Have students look up some of the different plants that are currently being domesticated, such as pennycress. Discuss with them some of the challenges and possible future applications.
- Have students in groups develop a presentation on a crop of their choice. Presentations can include the origin, time of domestication, pictures and traits of the wild plant, traits that were selected upon during domestication, and current uses/importance of the modern crop.