



## Plant Breeding Grades 3-5 Lesson Plan

**Grade:** 3-5

**Time:** 60-90 minutes

**NGSS Standard:**

3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.

**Essential Questions:**

- What technology is used to pass parent plant traits down to young plants?
- What environmental factors influence traits passed from one plant to another?

**Objective:**

- Students will investigate environmental factors that influence plant traits.
- Students will define gene editing and how it plays a role in farming technology.

**Vocabulary:**

**inherit:** genes passed down from a parent to their offspring

**traits:** characteristics that you inherit from your parents

**technology:** machines and equipment that help humans with work

**DNA:** a set of genetic instructions that make up organisms

**gene editing:** changing to improve the DNA within an organisms

**Materials:**

Toothpicks

Licorice

Gum drops

Paper

**Engage:**

To engage students, show the following YouTube video:

[Plan Breeding Innovation](#)

During the video, students will write down 2-3 ways farmers use technology to improve farming.



## **Explore:**

After the video, teachers will facilitate a whole group discussion about the current problems with farming and how technology will help solve those problems.

*Suggested questions:*

*What are the current challenges to farming?*

*Why is it important to use technology help improve farming?*

## **Explain:**

All organisms are made up of small building blocks called DNA. DNA is a blue-print or a map that make up living organisms. DNA has a set of instructions or genetic codes that determine what animals and plants look like. These are called traits. These traits are inherited from our parents (hair color, leaf color, etc). Parent organisms, producers of offspring, pass their traits to their offspring. For example, a seedling will develop small, narrow leaves from its parent plant. Human beings inherit traits from their parents such as hair and eye color.

The genetic code within DNA consists of sugars, phosphates and 4 nitrogen bases: adenine, thymine, guanine and cytosine. Plant scientists have uncovered ways to edit or change these bases to create a stronger more robust plant. Specific genes can be “cut” from a plant enhancing its ability to grow in a drought or resist disease.

## **Elaborate:**

Students will then elaborate how scientists use gene editing to improve farming.

Students will watch the following video:

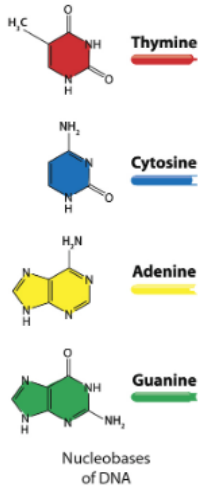
[Saving the Orange](#)

Gene editing allows scientists to insert, replace or remove a specific trait from one plant to another. For example, a scientist can insert a drought resistant trait to help plants grow during dry seasons! Student’s will build a DNA strand. Then, move the 4 main nitrogen bases to different locations to simulate gene editing.

*Step 1:*

Assign each color a name from the 4 nitrogen bases.

*Example: Yellow-adenine, Red-thymine, Green: guanine, Blue: Cytosine*



## Step 2:

Students use the following tomato DNA strand to place the color-coded gum drops between two pieces of licorice. Instruct students to twist the finished DNA strand.

### DNA Tomato Strand

G1-41-40 5' -CCTGAGAGGAAGCTGCTTCTGGAG-3'

G1-41-42 5' -CCTGAGAGGAAGCTGCTTCTGGAG-3'

G1-41-44 5' -CCTGAGGGGAAGCTGCTTCTGGAG-3'



Source: [www.littlebinsforlittlehands.com](http://www.littlebinsforlittlehands.com)

## Evaluate:

After students finish building the DNA strand, explain that scientists use technology to edit or “cut” specific genes to improve crop growth. Similar to CRISPR, students will simulate gene editing by changing the gum drops within the simulate DNA strand.

# innovate

Resources:

[www.littlebinsforlittlehands.com](http://www.littlebinsforlittlehands.com)

[www.betterseed.org](http://www.betterseed.org)

[www.innovature.com](http://www.innovature.com)

