

What are GMOs?

Focus questions	What are GMOs? How do they differ from plants that have been selectively bred? What are the techniques that are used in selective breeding?
Vocabulary	Genetics, trait, meiosis, genetic modification, selective breeding

HS-LS1: From Molecules to Organisms: Structures and Processes HS-ESS3: Earth and Human Activity

Performance expectation HS-LS1-1	Classroom connection: Students view a series of videos showcasing different breeding strategies.
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Science and engineering practices

Constructing Explanations and Designing Solutions	Classroom connection: Students begin to explain the differences between different breeding techniques.
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Disciplinary core ideas

LS1.A: Structure and Function	Classroom connection: DNA codes for the traits that help corn to grow more productively. Students begin to determine which methods help a plant to resist pests, absorb more nutrients, etc.
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Cross-cutting concepts

Structure and Function	Classroom connection: By the end of the unit, students will be able to explain why genetic modification is used in specific applications and not for others.
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Background

Up until the late 1970s, the only way to get desired traits in plants was through selective breeding. These techniques take time and many other traits get passed to the new generation beyond the desired ones, due to the sorting of chromosomes and crossing over that takes place during meiosis. In addition, many traits are controlled by multiple genes on different chromosomes.

Plant breeders have been able to overcome some of these obstacles by using genetic modification to improve crop characteristics, making them insect resistant (to resist corn borer), herbicide resistant (to live even when sprayed with a weed killer), disease resistant (i.e. rainbow papaya resistant to the ringspot virus), less prone to enzymatic browning (apples and potatoes turn brown after cutting) which helps reduce food waste, or to provide a health benefit (i.e. high oleic soybean oil).

Begin this unit by showing the following videos and asking students to make notes in their lab notebooks of their questions and observations while watching:

- Natural Selection vs Artificial Selection youtu.be/9hzWbTpxME8
- Selective Breeding Evolution and Biology youtu.be/fHS-0Y9XDZc
- What is genetic modification? youtu.be/rx953M-tpp4
- Genetic modification youtu.be/HZmZ161njr8
- How are GMOs made? youtu.be/2G-yUuiqIZ0