W 1090

GMOs

Genetically Modified Organisms

Alex Pfotenhauer, Graduate Student, University of Tennessee
Jennifer Richards, Associate Professor, Department of Agricultural Leadership, Education and Communications



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Skill Level
Intermediate (7th grade)

Educational Standards Addressed
7.LS1.1

Learner Outcomes

The learner will be successful if he is able to:

- Define biotechnology and recognize the value of biotech
- Identify products that could be genetically modified
- Evaluate science claims (closed readings) while avoiding gut reactions

Tag(s)
4-H Science

Time Needed – 30-60 minutes

Materials Needed

- white playdough
- playdough in a variety of colors

Author(s)

Alex Pfotenhauer, Graduate Student, University of Tennessee

Jennifer Richards, Associate Professor, Department of Agricultural Leadership, Education and Communications, University of Tennessee

Introduction to Content

The global population is expected to reach 10 billion people by 2050. Because of this, the world needs to find ways to enhance crop production for a more sustainable future. Scientists believe GMOs could be the solution to feeding the growing population.

Terms and Concepts

GMO (genetically modified organisms) are organisms whose genome has been engineered in the laboratory in order to favor the expression of desired physiological traits or the generation of desired biological products.

Introduction to Methodology

Using hands-on activities, students will gain a better understanding of what GMOs are and how they are created. They will first be introduced to GMOs by acquiring an object with DNA and an object without DNA, discussing these objects. Then they will learn more about GMOs in many ways, including a playdough example, a video and interesting examples of GMOs.

Setting the Stage

Introduce a fun activity to gain students' attention.

- **Ask students to go outside to find two objects, one with DNA and one without DNA.**

Experience

Bring students inside and pair them up to share their items.

- Discuss items and why they have DNA or not.
- Select one item from each group to share/rationalize.
- Collaborate to build a working definition of what can be genetically modified.

Ask the following questions to generate discussion:

- **What is biotechnology?** It's the use of biology to solve problems and make useful products. It uses genetic engineering to alter DNA of an organism to have specific traits.

- **What products can be genetically modified?** Fruits, vegetables, fish, animals, etc.

- **Why do you think GMOs are important?** GMOs allow crops to be immune to disease and grow faster.

- **If you could change one thing about your genetic item, what would it be?** Color, size, shape, etc.

Ask, *"Do you have a dog? Raise your hand if you do."*

Say, *"The concept of **GMOs** comes from artificial selection. This started 30,000 years ago, when our ancestors influenced selective breeding with wolves to make a companion which we now call dogs. As technology has increased over time, scientists have been able to dig deeper into the biology and DNA of organisms."*

Guided Practice: Playdough Example

1. Each student will receive a glob of white play dough.
2. Lay out different colors of play dough in a line in the front of the classroom.
3. Have each student go through the line of play dough, adding any colors they want to their white play dough.
4. Encourage students to make designs to create the perfect playdough for them.
5. Have students partner up and share their designs.

Strategies to Increase Student Engagement

- Before class begins, prepare golf ball sized play dough balls for each student to maximize instructional time.

Teacher Notes

Share

Explain how adding colors to the white playdough did not result in making it the same as the other playdough, but it is no longer white. It is new with elements of the other colored playdough. Another example would be an Atlantic salmon getting growth hormone genes from a Pacific Chinook salmon to make them grow faster. The fish would still be an Atlantic salmon just with a Pacific Chinook element.

Process

Provide these examples to the class:

1. **GMO (golden) rice** - Golden rice is genetically modified so that humans get some Vitamin A after eating it. Vitamin A is good for our immune system, vision and skin.
2. **GMO papaya** - Hawaii's papaya crops were destroyed by a ringspot virus. A GMO papaya named Rainbow papaya was created with elements to resist ringspot virus. This helped save Hawaii's papaya production.
3. **GMO cotton** - GMO cotton was made to be resistant to bollworms. This revived the Alabama cotton industry.
4. **GMO corn** - A common GMO corn is made with certain proteins that are toxic to insects only.
5. **GMO potatoes -** Certain potatoes are genetically modified to be more resistant to bruising and browning.

If time permits: Create student groups of 3-4 and assign each group one of the GMO products listed above. Have each group research their assigned product to determine:

a. What problem is addressed by the genetic modification?
b. How was the product genetically modified?

Explain: *"It is important to look at the big picture when it comes to GMOs. Sure there will be talk of it not being natural but GMOs have helped restore many industries (Hawaii's papaya, Alabama cotton industry)."*

Generalize

Reflect back to the playdough experiment, explain how the white playdough did not change completely, but gained certain elements from the other playdough. Relate this to the GMO products. (Example: The Atlantic salmon is still Atlantic salmon just with Pacific Chinook salmon growth hormone.)

Apply

Exit Ticket: Have students reflect on the items they chose **with** DNA in the first activity. Ask them to describe how they would make that item better. Students can record their descriptions on an exit slip to submit as they leave the classroom.

Supplemental Information
Educational Standards Met

Life Science

7.LS1.1: Develop and construct models that identify and explain the structure and function of major cell organelles as they contribute to the life activities of the cell and organism.

TIPPS
Life Skills

Identify possible solutions to a problem or situation. **HEAD-THINKING**

Consider the total situation when viewing a project; See the difficulties as a problem that can be endured or resolved.
HEAD-MANAGING

Programs in agriculture and natural resources. 4-H youth development, family and consumer sciences, and resource development. University of Tennessee Institute of Agriculture, U.S. Department of Agriculture and county governments cooperating. UT Extension provides equal opportunities in programs and employment.