What's a GMO?

Genetics and Ethics

K20 Center, Quentin Biddy
Published by *K20 Center*

Grade Level	8th Grade	**Time Frame**	2-3 class period(s)
Subject	Science	**Duration**	120 minutes
Course	Biology		

Essential Question

How does genetic engineering change organisms and how should scientific evidence guide decisions about its use?

Summary

In this lesson, students explore genetically modified organisms (GMOs) by building scientific understanding and engaging in evidence-based argumentation. Through research and real-world case studies, they analyze how genetic engineering changes organisms and evaluate its impacts. Students apply their learning in a debate, using scientific evidence to support claims and make informed decisions about the role of GMOs in society.

Snapshot

Engage

Students share and justify their initial beliefs about GMO safety, impact, and use by watching a video about public understanding of GMOs and participating in a Four Corners activity.

Explore

Students analyze a diagram of how GMOs are created, then work in groups to research real-world case studies, gathering biological, data-based, and real-world evidence.

Explain

Students craft their CER arguments by connecting claims, evidence, and scientific reasoning while addressing benefits, risks, and areas of uncertainty.

Extend 1

Students present and defend evidence-based arguments while evaluating opposing claims about the scientific and ethical use of GMOs in a structured debate.

Extend 2 (optional)

Students construct a final CER over GMOs as a whole.

Evaluate

Students reflect on their thinking and apply their understanding to a new real-world GMO scenario.

Standards

ACT College and Career Readiness Standards - Science (6-12)

IOD505: Analyze presented information when given new, simple information
EMI502: Determine whether presented information, or new information, supports or contradicts a simple hypothesis or conclusion, and why

Next Generation Science Standards (Grades 6, 7, 8)

MS-LS4-5: Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Oklahoma Academic Standards for Science (Grade 8)

8.LS4.5: Gather and synthesize information about the practices that have changed the way humans influence the inheritance of desired traits in organisms.

Attachments

- Cornell Notes—What's a GMO - Spanish.docx
- Cornell Notes—What's a GMO - Spanish.pdf
- Cornell Notes—What's a GMO.docx
- Cornell Notes—What's a GMO.pdf
- Four Corners Signs—What's a GMO.docx
- Four Corners Signs—What's a GMO.pdf
- How are GMOs Made—What's a GMO.docx
- How are GMOs Made—What's a GMO.pdf
- Lesson Slides—What's A GMO.pptx
- Research and Evidence Organizer—What's a GMO.docx
- Research and Evidence Organizer—What's a GMO.pdf

Materials

- Lesson Slides (attached)
- Four Corners Signs (attached; one set)
- How are GMOs Made handout (attached; one per student)
- Research and Evidence Organizer handout (attached; one per student)
- Cornell Notes handout (attached; optional)
- Juror Reflection Padlet (linked)
- Sticky notes (one per student; optional)

10 minutes

Preparation

Before you begin the lesson, print the **Four Corners Signs** and place around your room for the Engage activity.

For the Extend section you are invited to use Padlet. Make a copy of the Juror Reflection Padlet by clicking on the link provided which should automatically prompt you to “remake” or duplicate all the content to your own dashboard. Customize for your classroom needs as you see fit. Add the new link to slide 23 or your school LMS for students to access.

20 minutes

Engage

Use the **Lesson Slides** to facilitate this lesson. Begin the lesson by introducing the title and topic on **slide 2**. Then, navigate through **slides 3-4** to review the essential questions and learning objectives with students.

Move to **slide 5** and play the video clip What's a GMO? From Jimmy Kimmel Live.

Embedded video
https://www.youtube.com/watch?v=EzEr23XJwFY

After the video, proceed to **slide 6** and ask students what they already know about GMOS. Facilitate a brief whole-class discussion, recording student responses on the board or projected space to capture initial ideas and misconceptions.

Introduce the Four Corners strategy on **slide 7**. Designate each corner of the room as: Strongly Agree, Agree, Disagree, and Strongly Disagree. Explain that students will hear a series of statements related to GMOs, and they should move to the corner that best represents their current thinking.

Read each statement aloud, allowing students time to move to a corner. Once in place, have students discuss their reasoning with peers in their group and develop one or two shared justifications. Invite groups from each corner to share their thinking with the class before moving on to the next statement.

Transition through the statements on **slides 8-14**. Facilitate a brief discussion after each statement.

Teacher's Note: Students' Perspectives

There are no correct or incorrect answers during this activity. The purpose is to activate prior knowledge, engage students in meaningful discourse, and highlight the complexity of socio-scientific issues.

50 minutes

Explore

Display **slide 15**. Introduce the mock trial scenario, explaining that students will engage in a scientific argumentation debate about genetically modified organisms (GMOs). Emphasize that strong arguments must be grounded in scientific evidence and biological understanding, not just opinions.

Display **slide 16.** Provide students with the **How Are GMOs Made** handout. Instruct students to work in pairs to analyze the model and complete their handout. Allow students time to work.

Once students are ready, facilitate a short class discussion to clarify misconceptions and reinforce key ideas about how humans can influence inherited traits through biotechnology.

Teacher's Note: Guiding the Discussion

Be sure to clarify the following:

1. Both methods change traits by altering DNA.
2. Crossbreeding = many genes, less control.
3. Genetic modification = targeted genes, more precision.
4. Traits come from proteins coded by DNA.

Optional Discussion Question: Which method would you trust more if you were a farmer? Why?

Display **slide 17**. Distribute the **Research and Data Evidence Organizer** to each student. Organize students into groups of 4-5. Have each group select a real-world GMO case study and write in the space provided on their handout:

- Should scientists use modified rice to help prevent blindness in children?
- Should we allow genetically modified fish to be sold as food?
- Should farmers use modified crops that reduce the need for chemical pesticides?

Within each group, create paired groups (Team A and Team B) and assign a role per group so that one group serves as Team A: the affirmative (defense) and the other as Team B: the negative (prosecution). Instruct students to check off their assigned position for “You Role” on the handout.

Display **slide 18**. Explain to the students that their arguments must be grounded in scientific evidence from their assigned case, including:

- The genetic modification process (what gene is changed and how)
- The resulting trait in the organism
- Relevant scientific data or research findings

Instruct groups to gather evidence to support their assigned position and prepare for a scientific argument. Remind students that they should locate and record multiple types of evidence, not just what was identified from the provided GMO diagram. Allow students time to work through Parts A and B of the Research and Evidence Organizer.

Bring students back together and shift the focus from gathering information to making sense of patterns across their research. Display **slide 19** and ask groups to reflect on what they are noticing about genetic modification across different examples. Have groups share out key ideas. As students respond, record and organize their ideas into shared themes on the board or digitally (e.g. human need, environmental impact, ethical concerns), helping students see connections across different cases. Clarify misconceptions and reinforce that scientific understanding involves analyzing patterns and evaluating evidence.

Optional Scaffolding: Cornell Notes

Provide structure for organizing scientific information and key takeaways by providing students with the provided **Cornell Notes** handout. The Cornell Notes System poses specific questions to aid students in their search.

30 minutes

Explain

Transition to **slide 20** and review the debate structure to better inform students what to prepare for. Instruct students to now construct their arguments using the CER framework, ensuring their reasoning clearly connects scientific evidence to their claims. Display **slide 21** and direct students to “Part C” of their handout. Review the parts of CER. Encourage students to evaluate the credibility of their sources and to prioritize scientific research and data when building their arguments. Remind students that their goal is not just to “win” the debate, but to construct claims supported by evidence and clear scientific reasoning. Have students work on “Parts C and D” of their handout.

40 minutes

Extend 1

When all groups are prepared, display **slide 22** (if needed, review debate expectations from slide 20). Remind students that arguments must be supported by scientific evidence and that participants should not interrupt one another. Select a pair of opposing groups to begin the debate. All other students will serve as the jury. Instruct jury members to evaluate each argument, focusing on the use of scientific evidence, clarity of reasoning, and how well claims are supported.

After each debate, allow the jury to briefly discuss which arguments were most supported by scientific evidence before asking for their judgement (thumbs up for Team A or the affirmative and a thumbs down for Team B or the negative). Repeat the process with remaining groups.

After all debates have been concluded, move to **slide 23** and invite students to reflect on their experience as a juror, or listener, by answering the reflection questions on the prepared **Juror Reflection Padlet**.

Optional Low-Tech

While this Juror Reflection activity can be facilitated on the provided Padlet, if you're running low on time or have technology limitations use the slide to facilitate a quick verbal discussion instead.

30 minutes

Extend 2 (optional)

If time allows, and you feel your students need more practice writing a CER or honing their research skills, consider unhiding **slide 24** and have students work individually on the provided topic.

5 minutes

Evaluate

Display **slide 25** and allow students time to answer the Exit Ticket using the Bell Ringer/Exit Ticket strategy. You may collect their responses using sticky notes, through a brief verbal discussion, or following your usual classroom procedure.

Optional Real-World Application

If time allows, and your students show interest, unhide **slide 26** and facilitate a class discussion over the provided scenario and questions.

Resources

- Columbia YFD. (2013, April 16). YFD mock debate tutorial part 1 [Video]. YouTube. https://youtu.be/oN6Z1WKVh8g
- Columbia YFD. (2013, April 16). YFD mock debate tutorial part 2 [Video]. YouTube. https://youtu.be/zeposE11lrg
- Jimmy Kimmel Live. (2014, October 9). What's a GMO? [Video]. YouTube. https://youtu.be/EzEr23XJwFY
- K20 Center. (n.d.). Bell ringers and exit tickets. Strategies. https://learn.k20center.ou.edu/strategy/125
- K20 Center. (n.d.). Claim, evidence, reasoning (CER). Strategies. https://learn.k20center.ou.edu/strategy/156
- K20 Center. (n.d.). Cornell Notes. Strategies. https://learn.k20center.ou.edu/strategy/424cdc46cbbf68e0b9de3007cb0064eb
- K20 Center. (n.d.). Padlet. Tech Tools. https://learn.k20center.ou.edu/tech-tool/1077