



# What's a GMO?

## Genetics and Ethics



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<b>Grade Level</b>	6th – 12th Grade	<b>Time Frame</b>	2-3 class period(s)
<b>Subject</b>	English/Language Arts, Science	<b>Duration</b>	120 minutes
<b>Course</b>	Biology I		

### Essential Question

Is everything that is legally acceptable always ethically acceptable? What are genetically modified organisms (GMOs), and how are they produced? What are the ethical dilemmas surrounding GMOs and their use?

### Summary

In this lesson, students will learn about a divisive issue—genetically modified organisms, or GMOs—by discussing their opinions, conducting research on the topic with their peers, and, ultimately, taking part in a formal, courtroom-style debate. By conducting their own research and anticipating their peers' debate strategies, students can develop a perspective about GMOs with which to make informed decisions about genetic science and its role in today's society.

### Snapshot

#### Engage

Students view a video clip in which people on the street are asked what "GMO" means, and then engage in a discussion about what they know about GMOs. Students answer the question "Are GMOs good or bad?"

#### Explore

Students work in groups, forming a prosecution team or a defense team. With their groups, students rotate through stations to gather research about genetically modified organisms.

#### Explain

Students prepare for a debate by crafting opening and closing statements, making claims, citing evidence, and formulating questions for the opposition.

#### Extend

Students debate pros, cons, and ethical concerns regarding GMOs, presenting claims supported by evidence.

#### Evaluate

Students who are not in either active debating group listen to each of the debate proceedings as members of the jury. They analyze the arguments presented and use a rubric to "judge" the winner of the case.

## Standards

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

**EM1501:** Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with two or more data presentations, models, and/or pieces of information in text

*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.

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

**HS-LS3-2:** Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

*Oklahoma Academic Standards (8th Grade)*

**LS4:** Biological Unity and Diversity

*Oklahoma Academic Standards (8th Grade)*

**B.LS2.6.3:** Extreme fluctuations in conditions or the size of any populations, however, can challenge the functions of ecosystems in terms of resources and habitat availability.

*Oklahoma Academic Standards for English Language Arts (Grade 8)*

**8.1.R.3:** Students will engage in collaborative discussions about appropriate topics and texts, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole class settings.

**8.3.W.4:** Students will show relationships among the claim, reasons, and evidence and include a conclusion that follows logically from the information presented.

**8.6.W.2:** Students will refine and formulate a viable research question and report findings clearly and concisely, using a well-developed thesis statement.

## Attachments

- [Case Evaluation Rubric-What's a GMO - Spanish.docx](#)
- [Case Evaluation Rubric-What's a GMO - Spanish.pdf](#)
- [Case Evaluation Rubric-What's a GMO.docx](#)
- [Case Evaluation Rubric-What's a GMO.pdf](#)
- [Case Evaluation and Scoring Form—What's a GMO - Spanish.docx](#)
- [Case Evaluation and Scoring Form—What's a GMO - Spanish.pdf](#)
- [Case Evaluation and Scoring Form—What's a GMO.docx](#)
- [Case Evaluation and Scoring Form—What's a GMO.pdf](#)
- [Case Preparation Notes \(Student Handout\)—What's a GMO - Spanish.docx](#)
- [Case Preparation Notes \(Student Handout\)—What's a GMO - Spanish.pdf](#)
- [Case Preparation Notes \(Student Handout\)—What's a GMO.docx](#)
- [Case Preparation Notes \(Student Handout\)—What's a GMO.pdf](#)
- [Case Preparation Notes \(Teacher's Guide\)—What's a GMO.docx](#)
- [Case Preparation Notes \(Teacher's Guide\)—What's a GMO.pdf](#)
- [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](#)
- [Debate Structure Guide—What's a GMO - Spanish.docx](#)
- [Debate Structure Guide—What's a GMO - Spanish.pdf](#)
- [Debate Structure Guide—What's a GMO.docx](#)
- [Debate Structure Guide—What's a GMO.pdf](#)
- [Research Resources—What's a GMO - Spanish.docx](#)

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- [Research Resources—What's a GMO.pdf](#)
- [Research and Data Organizer—What's a GMO - Spanish.docx](#)
- [Research and Data Organizer—What's a GMO - Spanish.pdf](#)
- [Research and Data Organizer—What's a GMO.docx](#)
- [Research and Data Organizer—What's a GMO.pdf](#)

## Materials

- Case Evaluation and Scoring Form (one per student; attached)
- Case Evaluation Rubric (one per student; attached)
- Case Preparation Notes (Student Handout) (one per student; attached)
- Case Preparation Notes (Teacher's Guide) (optional; attached)
- Cornell Notes handout (optional; attached)
- Debate Structure Guide (attached)
- Research and Data Organizer (one per student; attached)
- Research Resources (optional; attached)
- Sticky notes (one per student)

# Engage

## Teacher's Note: Sticky Bars Activity Preparation

Before you begin the lesson, draw a horizontal line on chart paper or on a whiteboard space. Label one end of this line "good" and the other end "bad" according to the [Sticky Bars](#) learning strategy (see the example below).

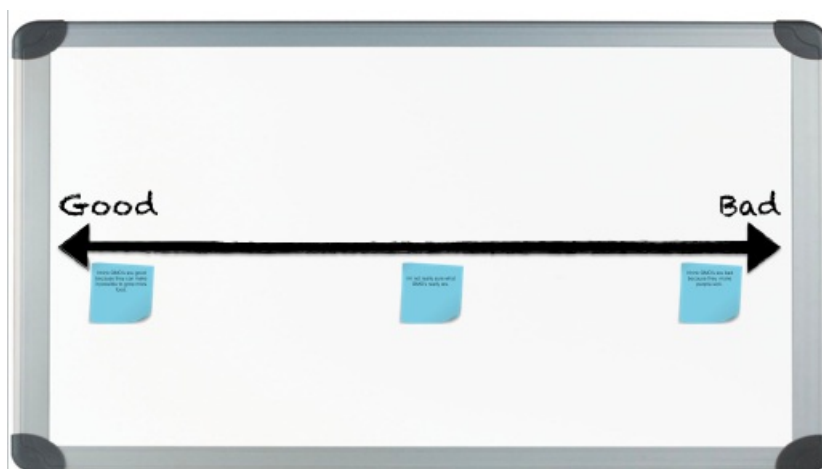
Begin by showing your students the clip [What's a GMO?](#) from Jimmy Kimmel Live.

### Embedded video

<https://www.youtube.com/watch?v=EzEr23XjwFY>

Afterward, ask students what they know about GMOs and invite them to share their thoughts with the class. Leave the question open for discussion. Write students' thoughts on a whiteboard or projector space to track the discussion.

Pass out a sticky note to each student for use in a [Sticky Bars](#) activity. Ask students to consider their own beliefs about whether GMOs are good or bad. Ask them to write the reasoning for their beliefs on their sticky notes and then post them along the graph line at a location that best reflects their beliefs (good, bad, or somewhere in the middle). The completed line should represent a distribution graph of all participants' beliefs.



*Example of a Sticky Bar graph with a few students' answers.*

Facilitate a class discussion based on what students have written on their notes and where they have placed them.

## Teacher's Note: Students' Viewpoints

Note that there are no right or wrong answers for this activity. The purpose is to engage students and help them see a spectrum of viewpoints regarding this and similar issues. This activity also represents an opportunity to read differing student responses out loud and engage students in a discussion around these viewpoints.

## Explore

Invite students to take part in a mock trial to debate the issues and ethics surrounding GMOs. Review the attached **Debate Structure Guide** with students. Discuss the format and time allotted for each portion of the debate.

### Teacher's Note: Debate Structure

The mock trial debate, which will take place in the Extend portion of the lesson, follows a structure that consists of the following phases: opening statements (1 minute per side), rebuttals (1 minute per side), cross-examination (2–3 minutes per side), second rebuttals (1 minute per side), closing statements (1 minute per side), and optionally, audience questions (2–5 minutes). You will act as moderator and timekeeper during the debate.

To help familiarize students with the public debate format, consider showing an instructional or example video such as this two-part tutorial: [YFD Mock Debate Tutorial Part 1](#) and [YFD Mock Debate Tutorial Part 2](#).

### Embedded video

<https://youtube.com/watch?v=oN6Z1WKVh8g>

Organize students into groups of 4–5, making sure to have an even number of groups so that you can pair each group with another group. Assign each pair of groups one of the following topics, with one of the groups serving on the defensive (affirmative) side, and the other serving on the prosecution (negative) side:

- Genetically modified animals
- Genetically modified agricultural crops

### Teacher's Note: Other Topics

You can also assign other GMO-related topics to suit your students' interests.

Ask each group to move to a separate table. Hand out a copy of the attached **Research and Data Organizer** to each student. Have groups conduct their own research, locating and citing evidence from a range of sources to support their conclusions. Let students know that this research will be used to construct their cases. This research should allow students to develop a perspective with which to analyze the information they will see later. You can also provide specific resources, such those on the attached **Research Resources** document for students to use.

### Teacher's Note: Research Resources

The Research Resources document features links for students to use as they do their research. If you decide to use this document, consider distributing it digitally so that students can navigate the links on their own devices. You might also choose to include other relevant resources or let students research topics independently using the internet or the library. Feel free to scale back the number of resources or highlight key resources in order to help students more easily find relevant information.

**Optional Activity: Gallery Walk**

If it better suits your classroom needs, consider having students collect evidence using a [Gallery Walk](#). With this strategy, students rotate to various stations, each featuring a different source (news article, research paper, podcast, et al.) that highlights positives or negatives of GMOs.

**Optional Activity: Cornell Notes**

To provide additional guidance for students as they collect their research, give them the Cornell Notes handout. The [Cornell Notes System](#) poses specific questions to aid students in their search.

## Explain

Give each student a copy of the following attached handouts: **Case Evaluation Rubric**, **Case Evaluation and Scoring Form**, and **Case Preparation Notes (Student Handout)**. On the Case Preparation Notes handout, have groups start by filling in their position and affirmative or negative status, and then have them refer to their research to complete the handout.

Students should prepare their opening and closing statements for their assigned position (affirmative or negative) *as well as* an anticipated opening and closing statement for the opposing position. Groups should work from these opposing opening and closing positions to construct their rebuttals.

### **Teacher's Note: Case Preparation Notes (Teacher's Guide)**

For further information about what students should include on the Case Preparation Notes handout, see the attached **Case Preparation Notes (Teacher's Guide)**.

## Extend

When all groups are prepared, review debate etiquette: participants should not interrupt each other and must stop when the buzzer sounds. As timekeeper, be sure to give a warning signal 30 seconds before time is up for each phase, and count down the final 5 seconds.

Select a pair of opposing groups to begin the debate.

Tell members of the other groups that they will serve as the jury. Jury members should label and fill out a scorecard on their Case Evaluation and Scoring Form handouts for every debate they watch. Have the jury take notes on the handout to explain their scores. If you are including audience questions at the end of each debate, jury members can use their notes to help identify questions.

Proceed with the debate according to the Debate Structure Guide. Begin with the affirmative group's opening statement (1 minute). Proceed to the negative group's opening statement (1 minute). Continue through rebuttals (1 minute per side), cross-examination (2–3 minutes per side), second rebuttals (1 minute per side), and closing statements (1 minute per side). If you choose to include audience questions (2–5 minutes), insert them between second rebuttals and closing statements or after closing statements. Act as moderator during the debates, keeping both groups within the time limits for each phase.

Repeat the debate process with the remaining pairs of groups.

### **Optional: Voting For Debate Winners**

If you choose, after each debate, you can poll jury members and tally up their votes to determine the winner.



# Evaluate

After all debates have been held, facilitate a class discussion based on the lesson's essential questions:

- What are genetically modified organisms (GMOs), and how are they produced?
- What are the ethical dilemmas surrounding GMOs and their use?
- Is everything that is legally acceptable always ethically acceptable?

Have students turn in their Research and Data Organizer, Case Evaluation Rubric, Case Evaluation and Scoring Form, and Case Preparation Notes handouts. These handouts function as evaluations for the lesson.

## 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.). Cornell Notes. Strategies. <https://learn.k20center.ou.edu/strategy/424cdc46cbbf68e0b9de3007cb0064eb>
- K20 Center. (n.d.). Gallery Walk/Carousel. Strategies. <https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505a54d>
- K20 Center. (n.d.). Sticky Bars. Strategies. <https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505ee0f>