

Lesson 3 – Investigating the GMO Controversy

Timeframe:

One 50-minute class period

Target Audience:

Any Middle School (6-8) or High School (9-12) class

Materials:

- Claim – Evidence – Reasoning Worksheet
- GMO Toulmin Example
- Stakeholder Roleplay Scenarios
 - Fisherman
 - Grocer
 - Scientist
 - Consumer

Description:

Students investigate the societal controversy surrounding the AquAdvantage Salmon, one of the GMO applications they learned about in Lesson 2. Students are assigned to specific stakeholder roles (e.g. fisherman, grocer, scientist, or consumer) and use various videos and sources of information to develop their own claim about GMOs based on what they learned about their stakeholder perspective. Then, students within the stakeholder group must come to consensus about what their claim is and present that shared argument with the rest of the class. This culminates in a class discussion about the differences in perspectives that result from stakeholder's interests and goals. As an extension, students reflect on their personal involvement in the GMO controversy as a consumer and whether they support/oppose this specific application given their own personal interests/goals.

Objectives:

- Students will understand:
 - GM products have ethical, environmental, economic, and social considerations (and benefits)
 - There will never be 100% support for these products, but they still provide value and may be appropriate in many applications
 - Different stakeholders have different opinions/considerations/perceived benefits about these products
- Students will be able to:
 - Find their own information to support their position/perspective
 - Identify the basic components of an argument (claim, evidence, and reasoning)
 - Build an argument with an appropriate claim, evidence, and reasoning.
 - Engage in discourse to come to group consensus about whether they support or oppose a specific GMO application and/or the technology.

Guiding Question:

- Why do different individuals have different opinions about AquAdvantage salmon?
- What is the role of science in determining what is possible versus what is socially acceptable? (Science is objective.)

Teacher Background:

The GMO conflict is complex given the variety of perspectives involved. Each stakeholder has a variety of interests in either supporting or opposing GMO technology based on their experiences, goals, and values. These various issues can be based in science/facts (e.g. improving weed management techniques on farms) or values (e.g. concern about the corporatization of the U.S. food supply). Some stakeholders have similar issues/interests within the GMO conflict, while others differ.

Here, we provide a brief overview of some of the interests of each of the general stakeholders in the GMO conflict. These general interests can differ among GMO applications.

- **Farmers** (*these general interests apply to both crop and fish farmers*)
 - Protecting their land and resources; ensuring their ability to farm on their land for multiple generations
 - Sustainability of farming operations
 - Producing quality foods with desirable traits/characteristics
 - Increasing yield through high yielding varieties, extended seasons, etc.
 - Increasing profits and ensuring that a majority of their yield is able to make it to market
 - Improving farming production processes through herbicide tolerance and pest resistance
 - Reducing crop losses to pests and pathogens
 - Reducing toxic inputs (e.g. fertilizers, herbicides, pesticides) to improve worker safety and improve environmental conditions of farm land
 - Growing safe products for human consumption
- **Scientists** (*This list refers to scientists in a broad sense. The scientist roleplay in this activity includes a native fish scientist who focuses on habitat and populations.*)
 - Developing safe products
 - Improving plants/animals to address humanitarian and environmental issues (e.g. malnutrition, climate resilience)
 - Ensuring these products don't have environmental impacts
 - Assessing the risk of these types of products
 - Sharing scientific information with the general public and farmers
 - Reducing general public's fear of GM techniques and products
 - Maintaining ability to use these techniques in the future
 - Updating federal government regulatory access to better reflect current methods and products
- **Consumer/General Public**
 - Improving consumer autonomy/right to choose whether they want to eat these products
 - Labeling these products
 - Increasing transparency about what products are GMO
 - Having access to safe food that is nutritious and delicious
 - Low prices
- **Grocery Store**
 - Stocking items that will sell

- Making a profit
- Ensuring products align with their brand
- **Activists/Consumer Advocacy Groups** (*This perspective isn't specifically included in the roleplay scenario, but the consumer group tends to rely on these interests as well, so they have been included to provide context.*)
 - Improving consumer autonomy/right to choose whether they want to eat these products
 - Mandating labeling of these products
 - Increasing transparency about what products are GMO
 - Informing general public about the dangers of GMOs
 - Banning these products and methods given potential, perceived, and actual risks
- **Corporations/GM product developers** (*not included in roleplay scenarios, but provides insight into their perspective for potential class discussion*)
 - Improving general public's understanding about GM techniques
 - Reducing general public's fear of GMO products
 - Developing commercial products that are safe and useful
 - Improving their profitability/bottom line
 - Maintaining the ability to use GM techniques in the future
 - Updating federal government regulatory process to better reflect current methods and products
- **Government** (*Not included as a stakeholder in the role play scenario but provides context to the objectivity of the federal government.*)
 - Ensuring the safety of U.S. food supply

Studies show that incorporating explicit instruction about argumentation into the classroom can enhance a students' ability to engage in successful arguments about complex scientific information. In this activity, we use a simplified version of **Toulmin's Model of Argumentation** (developed in 1958) to teach students the components of an argument. Understanding the Toulmin Model of Argumentation can help students develop writing, speaking, critical thinking, analysis, and decision-making skills, as well as develop well-reasoned arguments, analyze the limitations of an argument using logical reasoning, and evaluate the claims made by others.

We will primarily focus on claim, evidence/data, and reasoning, although the Toulmin Model also includes warrant, backing, and qualifiers for more advanced types of argumentation.

Toulmin's Model of Argumentation:

- **Claim** – What do I think? What am I arguing? What am I trying to get someone to agree with? A position on the issue. The thesis.
- **Data/Evidences** – How do I know this? How can I support/prove my claims? Evidences, facts, data, and information that are related to the claim you are making.
- **Reasoning** – Why do I think this? Why am I making the claims I am making?
- **Warrant** – Why is the evidence presented relevant to the claim? The part of the argument that explains why or how the data support the claim.
- **Rebuttals** – Statements indicating circumstances when the claim is not true. An argument against a counter-claim.
- **Qualifiers** – Words that limit the strength of the argument or propose the conditions under which the argument is true (e.g. "some", "75%", "most of the time").

It's important to know that scientific argumentation is quite different from typical arguing that goes on between people, which is seldom based on tangible evidence, and typically involves opinions, beliefs and emotion. The goal of a confrontational dispute is for one person's point of view to "win" over another's. In scientific argumentation, however, explanations are generated, verified, communicated, debated, and modified.

Activity Introduction:

- Building on what we learned last week about the science behind the AquAdvantage Salmon to understand the complex societal debate about the appropriateness of this GMO application/product.

Activity Procedure:

- Pass out the Claim-Evidence-Reasoning worksheet to students.
 - Introduce the components of the first three components of the Toulmin Model using the Claim-Evidence-Reasoning worksheet. Discuss the different terms and how they work together to develop an effective argument.
 - As a class, walk through the classroom example: iPhone
 1. Have the class make a claim by voting on a response to the question, "Should I buy the new iPhone?"
 2. Quickly Google 3 facts that can support the claim (e.g. battery life, number of users, cost)
 3. Use the sentence starters (in bold) to help connect the pieces evidence you found to the claim. E.g. (based on the class responding "yes"):
 - **"The evidence shows that..."**
 - ... the iPhone has increased in sales over time."
 - ... the iPhone has a longer battery life than most smart phones."
 - ... the iPhone is durable."
 - **"I know that..."**
 - ... good products are bought at high rates."
 - ... phone function is impacted by battery life."
 - ... cell phones are dropped or get wet at least once a day."
 - **"Therefore, I can conclude that** I would be satisfied with the iPhone because I would not have to charge it as often to keep my phone functioning properly, I would not have to spend additional money on repairing the phone and I would be purchasing a good product."
- *Use the GMO Toulmin worksheet as an example of how these components work together in an argument about GMOs.**
- Divide class into groups according to the stakeholder role they will be assuming: fish farmer, grocer, scientist, or consumer. Provide each group with the roleplay scenario associated with their stakeholder group.
 - Have each group brainstorm various values and interests that might be relevant to their assigned role
 - e.g. maintaining income, selling enough product to justify investment, purchasing safe food

- Each group sits together and uses the information and additional resources included in their roleplay scenario to learn more about their stakeholder perspective.
- After this, each student develops their own opinion (within their assigned stakeholder role) about whether they support/oppose this specific GMO application. Students write this down on their Claim-Evidence-Reasoning worksheet.
- Students share their opinion with the rest of the group to see the variation that exists within their peer group.
- Entire class participates in a “gallery walk”, looking at the various C-E-R each of their classmates made for their assigned stakeholder perspective.

Discuss:

- After the gallery walk, teacher leads class discussion about the various different perspectives involved in the conflict about this specific GMO application. Are there similarities or differences? Are there potential ways to solve this complex issue?

Extension:

- Instead of watching videos and using websites we provide, students can find their own data and evidence to build an argument for their assigned perspective.
- Have each stakeholder group come to consensus about their shared claim, evidence, and reasoning about whether they support/oppose this specific GMO application by engaging in discourse about their individual C-E-Rs.
- After the gallery walk, students reflect on their own personal opinion about whether they oppose/support this GMO application based on all of the different opinions they read.
- Students complete the activity assuming one role, and then complete the activity again assuming another stakeholder role to increase their perspective and critical thinking skills.

Resources:

- [Universty of Pittsburgh – Argument and Deliberation](#)
- [Youtube video outlining the components of Toulmin’s Model](#)
- [Argument Centered Education. 2017. Our Adaptation of the Toulmin Model of Argument.](#)

Next Generation Science Standards: