

Is it Good? Is it Bad? Genetically Modified Foods

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Grade Level High School
Duration 1-3 class periods

National Standards

GEOGRAPHY

Element 4: Human Systems

- 11. The patterns and networks of economic interdependence on the Earth's surface
- 14. How actions modify the physical environment
- 16. The changes that occur in the meaning, use and distribution and importance of resources.

AZ Standards

ELA

Reading

Key Ideas and Details

9-10.RI.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

Integration of Knowledge and Ideas

9-10.RI. 8 Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.

Writing

Text Types and Purposes

9-10.W.1 Write arguments focused on *discipline-specific content*.

- a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
- c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

SCIENCE

Life Science

Essential HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political

Arizona Social Science Standards

GEOGRAPHY

Examining human population and movement helps individuals understand past, present, and future conditions on Earth's surface.

HS.G3.1 Analyze the reciprocal nature of how historical events and the diffusion of ideas, technologies, and cultural practices have influenced migration patterns and the distribution of human population.

HS.G3.5 Evaluate the impact of social, political, and economic decisions that have caused conflict or promoted cooperation throughout time.

Global interconnections and spatial patterns are a necessary part of geographic reasoning.

HS.G4.1 Take an active stance on a geographic issue reflecting its scale (local, regional, state, national, or global)

HS.G4.2 Analyze patterns of global power and influence in respect to trade, demographics, politics, and resource availability and use.

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implications of human activity on the biodiversity of an ecosystem.

TECHNOLOGY

9-10.SL.2 Integrate multiple sources of information present in diverse media formats.

SIOP Elements		
Preparation Adapting content Linking to background Linking to past learning Strategies used	Scaffolding Modeling Guided practice Independent practice Comprehensive input	Grouping Option Whole class Small groups Partners Independent
Integrating Processes Reading Writing Speaking Listening	Application Hands on Meaningful Linked to objectives Promotes engagement	Assessment Individual Group Written Oral

Arizona English Language Proficiency Standards

Grade 9-12

Basic

Listening and Reading

Standard 1 By the end of each language proficiency level, an English learner can construct meaning from oral presentations and literary and informational text through grade appropriate listening, reading, and viewing.

B-1: determine the central idea or theme and explain how they are supported by using text evidence.

B-2: recount a text including specific details and information.

B-5: utilize visual information to understand the text.

Speaking and Writing

Standard 3 By the end of each language proficiency level, an English learner can speak and write about grade appropriate complex literary and informational texts and topics.

B-1: deliver short oral presentations that include some details to develop a topic.

B-3 compose informational text that include relevant details, concepts, and examples to develop a topic while using appropriate conventions.

B-4: integrate graphics or multimedia when useful.

B-5: use examples of precise language and domain-specific vocabulary within informative texts.

Standard 4 By the end of each language proficiency level, an English learner can construct grade appropriate oral and written claims and support them with reasoning and evidence.

B-1: construct a claim about a topic or text.

B-2: introduce the claim and provide logically ordered reasons or facts that effectively support the claim.

B-4: provide a concluding statement to an argument.

Listening, Speaking, Reading, and Writing

Standard 6 By the end of each language proficiency level, an English learner can participate in grade-appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.

B-1: participate in discussions about familiar topics and texts.

B-2: participate in written exchanges about grade-appropriate topics and texts.

B-5: review information expressed by others and add relevant information and evidence to collaborative oral and written discussions.

B-7: summarize the key points expressed.

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Standard 7 By the end of each language proficiency level, an English learner can conduct research and evaluate and communicate findings to answer questions or solve problems.
B-1: gather information from multiple provided resources to answer questions.
B-2: summarize the main idea using evidence from text or presentations.
B-3: paraphrase observations, information notes with labeled illustrations, diagrams, or other graphics, as appropriate.

Overview

Scientists have increased food production by using genetically modified organisms (GMOs). The resulting foods are known as bioengineered (BE) foods. This use of GMOs has consumers wondering: Is this a good thing or not?

Purpose

In this lesson, students will learn how much of the corn and other farmed goods produced in the U.S. are GMOs (BE foods). They will then write an argument supported by evidence on use of GMOs in our society. This lesson includes strategies for diverse learners (ELLs).

Key Vocabulary

genetics: the study of genes and traits in plants and animals
genetic engineering: altering the genetics of a plant or animal organism
insert: to put one thing into something else
organic: plants and animals grown with natural methods

Materials

- Vocabulary cards
- Products to analyze (If you can not get the actual products, use pictures to show the difference.)
 - picture of golden rice vs. regular rice.
 - organic cotton vs. GMO cotton
 - organic corn chips vs. GMO corn chips
 - organic papaya vs. GMO papaya
 - organic soy flour vs. GMO soy powder
 - organic apple vs. GMO apple
- GMOs PowerPoint
- CSA Discovery Guides: Genetically Modified Foods: Harmful or Helpful?
http://artsci.ucla.edu/biotech177/reading/GMO_Harm_or_Help.pdf
- Genetically Modified (Bioengineered) Food Writing Project Directions

- Helpful Links
- Genetically Modified (Bioengineered) Food Writing Project Scoring Guide
- Poster boards and markers
- Internet access and computers
- Vocabulary Test

Objectives

The student will be able to:

1. Explain what are GMOs (BE foods) and the controversy that surrounds them.
2. Write an argument analyzing both sides of the controversy.

Procedures

Prior to Session One: Teacher will need to organize the class into centers around the different organic and genetically modified products. (Example: Both apples should be cut open and placed side by side at a table and labeled O (organic) and G (GMO) Apples. Continue the same pattern for the other products.)

SESSION ONE

Engage:

- a. Show the students the key vocabulary words either by printing up the vocabulary cards or projecting the cards. Discuss the meaning of each.
- b. Next explain to the students they will take notes in their notebooks as they walk around the room viewing the different centers. Tell them each center contains a different agricultural product. Ask them to list out the differences by viewing, touching, and tasting (when applicable) between the O product and the G product. They should write out those differences in their notebook. **(Written Assessment: individual; Grouping Option: Partners; Application: Hands on)**

Explore:

- c. After students have recorded their observations, solicit their findings and list them on the board. Have students comment on how are the two products are the same and how are they different. **(Grouping Option: Whole class)**

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d. Introduce the idea of organic and genetically modified (bioengineered) foods. Explore as a class what these two terms mean. Refer back to those key vocabulary terms. **(Scaffolding: Comprehensible input)**

Explain:

e. Show the GMOs PowerPoint on corn. Emphasize the impact of GMOs on agriculture (bioengineered corn makes up as much as 90% of the all sweet corn grown). Then discuss the where, why, and how of scientists have created GMOs using the PowerPoint. Refer back to those key vocabulary terms. **(Scaffolding: Comprehensible input)**

Elaborate:

f. Show the students a short 7-minute clip from Food Inc. in which GMO foods are discussed. www.youtube.com/watch?v=BIOGBkxurb0 "From Seed to the Supermarket" Clip begins at 1:06:12 with a shot of a sunrise over a farm and ends at 1:16:02 with the on-screen text: "Monsanto declined to be interviewed for this film." **(Scaffolding: Comprehensible input)**

SESSION TWO

Prior to this session: Download this article http://artsci.ucla.edu/biotech177/reading/GMO_Har_m_or_Help.pdf and copy into 6 sections by these headings:

1. *What are genetically-modified foods?*
2. *What are some of the advantages of GM foods?*
3. *How prevalent are GM crops? What plants are involved?*
4. *What are some of the criticisms against GM foods?*
5. *How are GM foods regulated and what is the government's role in this process?*
6. *How are GM foods labeled?*

g. Divide the students into 12 groups. Hand out a poster board and markers for each group. Hand out the 6 different sections of the article; 2 groups will have a section. **(Grouping Option: Small groups)**

h. Have students read the articles and make a poster sharing key points of the article with the class.

i. Once groups have finished their reading and poster, have groups share with the whole class. **(Integrated Processes: Reading, Speaking, Listening)**

j. As a class, list out the pros and cons that have been discussed during poster presentations. **(Scaffolding: Comprehensible input)**

SESSION THREE

Evaluate:

k. Tell the students that they will be completing an electronic writing project based on GMOs. Their argument will need to include a definition of GM organisms, pictures of GMO (bioengineered) products, and a map of where most GMO agriculture is found in the U.S. or world, etc. Share the Genetically Modified Food Project Directions, Helpful Links, and the Scoring Guide. Stress that the project needs to include both pros and cons of the controversy that surround GMOs and the conclusion must give your opinion on GMOs and you must support your opinion with evidence. **(Written Assessment: Individual)**

l. Projects can become homework if not completed in class.

Assessment

ELA and Geography

The GM Foods Project can be graded using the project scoring guide. The English proficient students will score 80% or higher to be considered mastery. Diverse learners will have the project assignment altered to include a fewer number of pros and cons (perhaps only one if they are beginning to learn English). And then write a sentence stating their opinion and why.

Students will score 75% or higher on the vocabulary test to be considered mastery.

Extensions/Alternatives

- The teacher can split the class into two groups favoring GMOs and opposing GMOs. Have the students debate the issues.
- The teacher can have the students make a cover for [National Geographic](#) or [Time](#) magazine featuring GMOs.

Sources

www.youtube.com/watch?v=BIOGBkxurb0

The full Food Inc. video can be seen at: <http://putlocker.is/watch-food-inc-online-free-putlocker.html>

The Food Ark: The loss of seeds due to GMOs <http://ngm.nationalgeographic.com/2011/07/food-ark/siebert-text>

Genetically Modified Foods (GMOs)

The five step plan to feed the world by National Geographic:

<http://www.nationalgeographic.com/foodfeatures/feeding-9-billion/>

The Food Ark: The loss of seeds due to GMOs

<http://ngm.nationalgeographic.com/2011/07/food-ark/siebert-text>

"Food

Altered": <http://environment.nationalgeographic.com/environment/global-warming/food-how-altered/>

Problems with GMOs

<http://listverse.com/2013/06/22/10-problems-genetically-modified-foods-are-already-causing/>

Monsanto Article and feed the world:

<http://www.monsanto.com/newsviews/pages/biotech-safety-gmo-advantages.aspx>

Mission- Feeding the world:

<http://12.000.scripts.mit.edu/mission2014/genetically-modified-crops>

Drought resistance Crops:

<http://www.technologyreview.com/featuredstory/522596/why-we-will-need-genetically-modified-foods/>