



Lesson Plan: The Impact of Genetically Modified Seeds

THE FILM

This lesson plan utilizes the film and POV's website resources for, **Food, Inc.**, a documentary that examines food in the United States and the industry that produces it. Classrooms can use these materials to explore the benefits and controversies of using genetically modified seeds.

POV documentaries can be recorded off-the-air and used for educational purposes for up to one year from their initial broadcast. In addition, POV offers a lending library of DVDs and VHS tapes that you can borrow any time during the school year — FOR FREE! Get started by joining our Community Network:

www.amdoc.org/outreach/events/

Please visit our Film Library at http://www.amdoc.org/outreach_filmlibrary.php to find other films suitable for classroom use.

OBJECTIVES

By the end of this lesson, students will:

- Consider the prevalence of genetically modified seeds in the food supply.
- Use viewing skills and strategies to understand and interpret a video clip.
- Discuss the right of companies to patent genetic innovations.
- Evaluate how keeping seeds in the public domain could impact innovation in biotechnology.
- Determine the relationship between biodiversity and food security.
- Select the three most important benefits and/or controversies related to the use of genetically modified seeds and explain their significance in a position paper.

GRADE LEVELS

6-12

SUBJECT AREAS

Economics, Civics, U.S. History, Current Events, Language Arts

MATERIALS

- Method of showing the entire class an online video clip and Web pages

ESTIMATED TIME NEEDED

One 50-minute class period

FILM CLIP

"From Seed to the Supermarket" (length 9:50)

The 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."

ACTIVITY

1. Before class, cue up question five from POV's online quiz "How Much Do you Know About GMOs?" (http://www.pbs.org/pov/foodinc/photo_gallery_quiz.php)
2. Begin the activity by asking students whether they've eaten a genetically modified food (sometimes referred to as GMO, which stands for genetically modified organism) that day. Point out that while food labels don't currently identify ingredients that have been genetically modified, some conclusions can be drawn about possible consumption of them by looking at the market penetration of food from genetically modified seeds.
3. Display question five of the quiz. Ask students how many of them think the answer to the question is A, B and so forth. Click on the answer selected by the majority of students and discuss why they chose that answer. If they chose incorrectly, ask if they were surprised at the actual answer. Repeat this process for questions six and seven. Point out that most processed foods contain corn and/or soy ingredients, so if students have eaten any processed foods that day, chances are high that they've eaten foods that contain genetically modified ingredients.
4. Tell students that genetically modified crop seeds have only been available since the mid-1990s. To make such seeds, companies manipulate the gene sequence in a plant's DNA so that it has special traits, such as the ability to tolerate a specific weed killer while the plants around it die. Companies can then patent these genetically modified seeds, which gives them the legal right to control the use of any seed that contains their patented gene sequence. This situation has changed agricultural practices and spurred controversy.
5. Show the class the video clip "From Seed to the Supermarket." Focus students' attention by asking to them to take notes on concerns about genetically modified seeds voiced by those in the film.
6. Display the Human Genome Project Information Sheet about Genetically Modified Food and Organisms (http://www.ornl.gov/sci/techresources/Human_Genome/elsi/gmfood.shtml) and review the Benefits and Controversies section. (For the purposes of this lesson, skip the points about animals.) Discuss:
 - When companies have invested resources in developing genetic material, should they have the right to patent it? Why or why not?
 - How might keeping seeds in the public domain affect innovation in biotechnology?
 - What would happen if genetically modified seeds fail or become vulnerable to certain pests or crop diseases? What is the relationship between biodiversity and food security?
7. Conclude the activity by having students individually review the list of benefits and controversies of genetically modified seeds and select the three most important factors related to their use. Students should then explain the significance of these factors in position papers that they complete for homework.

ASSESSMENT SUGGESTIONS

Students can be assessed on:

- Contributions to class discussion.

- The quality of information and analysis in their position papers.

EXTENSIONS AND ADAPTATIONS

- **Examine the use of genetically modified seeds in India.** In February 2010, India banned the use of genetically modified eggplant seeds. Have the class break up into pairs and read a *BusinessWeek* article (<http://www.businessweek.com/news/2010-02-10/india-rejects-first-gm-vegetable-hampering-monsanto-update1-.html>), circling the potential risks of the seeds and underlining the potential benefits. Then ask each pair to write two sentences that summarize the positions of those for and against using these seeds in India. Discuss how the needs of India differ from those of the United States.
- **Explore the issue of food labeling.** How do students feel about eating food that may contain ingredients made from genetically modified crops? Should they have a choice? Should such products be clearly labeled? Have student groups study and research the *Pros and Cons of Labeling* (<http://www.bio.davidson.edu/people/kabernd/seminar/2004/GMevents/NH/Debate.html>) and hold a class debate.
- **Engineer a Crop.** The *NOVA/Frontline* website Harvest of Fear provides two interactive simulators that students can use to try out selective breeding and transgenic manipulation (<http://www.pbs.org/wgbh/harvest/engineer/index.html>). Afterwards, have students compare the two methods and describe the strengths and weaknesses of each.

RESOURCES

Agricultural Biotechnology

http://www.pewtrusts.org/our_work_detail.aspx?id=442

The Pew Charitable Trusts presents a series of reports that examine the opportunities and challenges offered by biotechnology. The study of this issue concluded in 2007.

Conversations About Plant Biotechnology

<http://www.monsanto.com/biotech-gmo/asp/default.asp>

This website from Monsanto provides a video gallery with messages about the safety and benefits of genetically engineered foods and crops.

Harvest of Fear

<http://www.pbs.org/wgbh/harvest/>

This *NOVA/Frontline* special report explores the growing fight over genetically modified food. The viewpoints page provides expert analysis both for and against using biotechnology.

STANDARDS

These standards are drawn from "Content Knowledge," a compilation of content standards and benchmarks for K-12 curriculum by McRel (Mid-continent Research for Education and Learning) at <http://www.mcrel.org/standards-benchmarks/>.

Agricultural Education

Standard 1: Understands the connections between agriculture and society.

Standard 2: Understands trends, issues and events that have influenced agricultural practices throughout history.

Standard 9: Understands how various technologies are used in the agricultural industry.

Behavioral Studies

Standard 1: Understands that group and cultural influences contribute to human development, identity and behavior.

Language Arts

Standard 1: Uses the general skills and strategies of the writing process.

Standard 7: Uses reading skills and strategies to understand and interpret a variety of informational texts.

Standard 9: Uses viewing skills and strategies to understand and interpret visual media.

United States History

Standard 31: Understands economic, social and cultural developments in the contemporary United States.

ABOUT THE AUTHOR

Cari Ladd, M.Ed., is an educational writer with a background in secondary education and media development. Previously, she served as PBS Interactive's director of education, overseeing the development of curricular resources tied to PBS programs, the PBS TeacherSource website (now PBS Teachers) and online teacher professional development services. She has also taught in Maryland and Northern Virginia.