

**Overview:**

In this lesson, students will examine the pros and cons of GMOs, especially those that we consume. Students will analyze the facts to develop and articulate their own opinions on the matter.

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**NOTE:** For this lesson, it is important that students have prior knowledge of heredity and the structure and function of DNA.

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**Objectives:**

The student will:

- identify different types of GMOs that are common in their daily lives;
- discuss the pros and cons of GMOs; and
- apply their knowledge of GMOs to subsistence foods in their own area.

**Targeted Alaska Grade Level Expectations:****Science**

[10] SC1.3 examining issues related to genetics

**Vocabulary:**

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**NOTE:** Throughout this lesson plan, the term “natural” will be used to juxtapose the term GMO, or genetically modified organism.

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**Genetic Engineering** –the manipulation of an organism’s genetic structure by introducing or eliminating specific genes.

**GM** – Genetically Modified (usually refers to foods)

**GMO** – Genetically Modified Organism. This is done when scientists modify an existing organism by adding a gene or genes from a different organism.

**Transgenic** – a new organism created by inserting the genes from another organism. Also known as a GMO.

**Materials:**

- 4x6 notecards (1-2 / student)
- GMO and “natural” foods (vegetables, fruits, cereals, etc.)
- Colored, laminated pictures of GMO and “natural” foods (optional)
- Laptop computers with internet access
- Downloaded copies of the “Super Salmon,” “Bt Corn,” and “Classical vs. Transgenic Breeding” videos from PBS (courtesy of Teacher’s Domain) [http://www.teachersdomain.org/resource/tdc02.sci.life.gen.lp\\_bioengfood/](http://www.teachersdomain.org/resource/tdc02.sci.life.gen.lp_bioengfood/)
- STUDENT WORKSHEET: “Pro / Con” note-taking sheet for each student.
- One copy “Pro / Con” fact sheet (teacher reference)
- Sheets of butcher paper for each group
- Markers for each group

**Activity Preparation:**

1. Purchase a variety of foods (both GMO and “natural”) that you can put on display for students.

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**NOTE:** If GMO and “natural” foods cannot be obtained, prepare sets of pictures of GMO and “natural” foods.

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2. Preview the videos to ensure the links are still active, and to tailor discussion points to your students.

3. Make copies of the "Pro / Con" note-taking sheet for each group / student.
4. Secure sheets of butcher paper and markers for each group.

**Hook/Pre-Assessment:**

1. Before students walk into the room, have on display some examples of foods that have been genetically-engineered laying directly next to the same type of food that has not been engineered (e.g., a piece of GMO ear of corn and a "natural" ear of corn.)

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**NOTE:** Some grocery stores voluntarily label produce that has been genetically-engineered. A list of processed foods that use GMO ingredients can be found at Greenpeace's True Food Network: <http://www.truefoodnow.org/shopping/>. If GMO and "natural" foods cannot be locally obtained, lay out pairs of pictures.

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2. Give each student a 4 x 6 notecard.
  - Ask students to examine the foods on display.
  - On their note cards, students should note any differences or similarities they notice. (Have them touch, smell, taste (if appropriate) each item).
3. After students have examined the foods, have them return to their seats, turn their note cards over and answer these three questions on the back:
  - Does genetically-engineered food look, smell, or taste any different from those that are not genetically-modified?
  - What makes genetically-modified foods distinctive?
  - Why would biologists attempt to do this kind of work?
4. Have students share their thoughts (both their notes and the answers to their questions) with a shoulder partner.
  - Then, have partners share their ideas aloud, with the class.
  - Use this as a lead-in discussion on GMOs.

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**NOTE:** You may collect their notecards to use as a more formal pre-assessment. Alternatively, you may have students turn them in at the end of the class with a second card, on which they have written their "post-lesson" responses to these same three questions.

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**Activity Procedure:**

1. Divide students into three groups. Each group will be responsible for viewing a short video and reading a short background essay on a particular aspect of genetically modified organisms.
2. Instruct students which of the three videos and essays they will be responsible for ("Bt Corn," "Classical vs. Transgenic Breeding," or "Super Salmon.")

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**NOTE:** Each of the videos and essays can be found at the Teacher's Domain website: [http://www.teachersdomain.org/resource/tdc02.sci.life.gen.lp\\_bioengfood/](http://www.teachersdomain.org/resource/tdc02.sci.life.gen.lp_bioengfood/).

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3. Give each group a "Pro / Con" note-taking sheet.
  - a. Each group will be responsible for explaining the issues presented in their video and background essay.
  - b. Groups should use this note-taking sheet to write down important facts that all students should know.

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**NOTE:** Use the attached "Pro / Con" fact sheet to ensure that students identify each crucial issue.

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4. Provide each group with a sheet of butcher paper and markers. They should use this to create a visual that suggests the overall "pro" and the overall "con" of their topic.
5. When each group is ready, have them present their issue, facts, and visual to the rest of the class. While each group presents, students in the audience should fill in the rest of their "pro / con" note sheet.

6. After each group has presented, ask students to think for a moment about the salmon population in their village, and to determine (in their own heads) how important that resource is (very important / somewhat important / neither important nor unimportant / somewhat unimportant / very unimportant).
  - a. Write each Likert category on the board.
  - b. As students determine their thoughts, have them come to the board and tally their response.
7. Based on student responses, lead a discussion on the impacts that GMOs could have in their community.
8. If time in your unit permits, continue the lesson with the extension activity or the community action activities (or both!) below.

### Assessments

1. On a 4 x 6 card, ask students to think about what they've learned, and respond to the following quote: "Your scientists were so pre-occupied with whether or not they could, they didn't stop to think if they should" (Jurassic Park 1993).

Use this card as an "exit card" that students must turn in as they leave the classroom/lesson.

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**NOTE:** Alternately, use the same questions as presented at the beginning of the lesson during the "hook" activity.

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### Extension Idea:

Using the exit card above as a jumping off point, break students into teams for a debate on the GMO issue. On each team, there should be 1-3 speakers, 1-3 notetakers, and 1-3 researchers.

Each speaker needs to be able to speak for the group, present the group's argument, and rebut the other team.

Each note taker should actively take notes during the debate, and highlight key points that the speakers should address (either points that the other team brings up, or points that should be expanded upon).

Each researcher should have access to a laptop computer and the internet during the debate. These students should be "fact checking" anything that needs a check during the debate.

It works well to give students ample time to prepare for the debate (2 class periods), instruct them to come dressed for the debate, and to have a panel of judges (other faculty, community members, etc.) who will judge the debate and pronounce a winner. You can choose to have the winners receive a prize (extra credit, 1 "freebee" homework, etc.), or not.

Teams should be awarded points (by the judges) for (1) creativity of their approach / presentation of evidence, (2) accuracy and order of their argument, and (3) poise and manner of presentation (i.e., non-confrontational).

### Community Action/Involvement:

Students research the amount of salmon harvested each year in their own village and petition Congress to help ensure future access to this vital subsistence food.

- Students create a presentation to be presented at a village or town meeting, on the consequences of genetically modified salmon and its potential effects on community subsistence.
- Students poll village / town members about the number of fish they depend on each year and the consequences that losing the resource would have.
- Students create an imovie presentation on the vital need for a healthy salmon population and send it with a class letter to Alaska Congress members.

**Resources:**

*"Genetically Modified Foods: From the lab to the dinner table."* By Christopher Charnitski, courtesy of PBS. <http://www.pbs.org/newshour/extra/teachers/lessonplans/science/gmofoods.html>

*"Genetically Modified Foods."* By Now, courtesy of PBS. [http://www.pbs.org/now/printable/classroom\\_genes\\_print.html](http://www.pbs.org/now/printable/classroom_genes_print.html)

*"Bioengineered Foods?"* By Teacher's Domain. [http://www.teachersdomain.org/resource/tdc02.sci.life.gen.lp\\_bioengfood/](http://www.teachersdomain.org/resource/tdc02.sci.life.gen.lp_bioengfood/)

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**NOTE:** Each of the above websites offers full lesson plans that may be useful either as extension activities, or as part of a larger unit on GMOs.

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*"Super Salmon"* 5 minute video by PBS. Courtesy of Teacher's Domain. <http://www.teachersdomain.org/resource/tdc02.sci.life.gen.salmon/>

*"Bt Corn"* 5 minute video by PBS. Courtesy of Teacher's Domain. <http://www.teachersdomain.org/resource/tdc02.sci.life.gen.btcorn/>

*"Classical vs. Transgenic Breeding"* 5 minute video by PBS. Courtesy of Teacher's Domain. <http://www.teachersdomain.org/resource/tdc02.sci.life.gen.breeding/>

NAME: \_\_\_\_\_  
PRO / CON

STUDENT WORKSHEET  
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Pro	Con
My Group's Topic:	
Topic:	

NAME: \_\_\_\_\_  
PRO / CON

STUDENT WORKSHEET  
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Pro	Con
Topic:	