

**Title:** The BT Corn Debate

**Introduction:** In this lesson students are introduced to the debate on the use of Genetically Modified Organisms (GMO's) as a food source by reading the **New York Times** article entitled "Both Sides Cite Science to Address Altered Corn". This article gives an unbiased look into the debate. From the information gained in the article students begin to draw their own conclusions about whether or not it poses threat to the environment. Students should then research the topic of using Bt corn are asked to write a short paper defending their stance on the issue. This activity is appropriate for a general high school biology class or can be modified for honors or AP biology.

**Learning Outcomes:**

1. Students will interact with supplementary texts on a scientific topic.
2. Students will evaluate the use of genetically modified crops.
3. Students will be able to provide supporting evidence for their stance on current scientific issues.

**Curriculum Alignment:**

National Standards addressed by this lesson include content standards for grades 9-12 for the Life Sciences. Fundamental concepts include the molecular basis for heredity and the interdependence of organisms.

**North Carolina Standards**

**Biology**

- 3.04** Assess the impact of advances in genomics on individuals and society.
- Applications of biotechnology.

**English III**

**3.01** Use language persuasively in addressing a particular issue by:

- finding and interpreting information effectively.
- recognizing propaganda as a purposeful technique.
- establishing and defending a point of view.
- responding respectfully to viewpoints and biases.

**3.02** Select an issue or theme and take a stance on that issue by:

- reflecting the viewpoint(s) of Americans of different times and places.
- showing sensitivity or empathy for the culture represented.
- supporting the argument with specific reasons.

**3.03** Use argumentation for:

- interpreting researched information effectively.
- establishing and defending a point of view.
- addressing concerns of the opposition.

- using logical strategies (e.g., deductive and inductive reasoning, syllogisms, analogies) and sophisticated techniques (e.g., rhetorical devices, parallelism, irony, concrete images).
- developing a sense of completion.

**4.03** Assess the power, validity, and truthfulness in the logic of arguments given in public and political documents by:

- identifying the intent and message of the author or artist.
- recognizing how the author addresses opposing viewpoints.
- articulating a personal response to the message and method of the author or artist.
- evaluating the historical significance of the work.

**6.01** Demonstrate an understanding of the conventions of language by:

- decoding vocabulary using knowledge of Anglo-Saxon, Greek, and Latin bases and affixes.
- using vocabulary strategies such as context clues, resources, and structural analysis (roots, prefixes, etc.) to determine meaning of words and phrases.
- revising writing to enhance voice and style, sentence variety, subtlety of meaning, and tone in considerations of questions being addressed, purpose, audience, and genres.

**Classroom Time Required:** Classroom time will vary based upon the amount of time given to students for research. Some may introduce the lesson during a single 50 min class period and assign the research and writing phases as an independent homework assignment. Others may want to provide students with an additional time for supervised research using library or internet resources.

**Materials Needed:**

- Copy of the article “Both Sides Cite Science to Address Altered Corn” article may be accessed at [http://www.nytimes.com/2007/12/26/business/worldbusiness/26corn.html?\\_r=1&scp=1&sq=Both%20Sides%20Cite%20Science%20to%20Address%20Altered%20Corn&st=cse](http://www.nytimes.com/2007/12/26/business/worldbusiness/26corn.html?_r=1&scp=1&sq=Both%20Sides%20Cite%20Science%20to%20Address%20Altered%20Corn&st=cse)
- *Graphic organizer chart for recording information from essay and taking additional notes from research.*
- *Framer charts for new vocabulary (optional)*

**Technology Resources:**

- *Computer with internet access to acquire article*
- *Computer for word processing essay. (Optional)*

**Pre-Activities/ Activities:** Students should have been introduced, through the use of their biology text, to the use of GMO’s and how GMO’s are produced prior to introducing this lesson. The Instructor

should also have students preview article for any unfamiliar vocabulary beyond that included in the critical vocabulary section. Frayer charts are used to assist students in understanding new vocabulary that may be found in the article. Information on using Frayer charts can be found in the resources section.

- **Engage:** Engage students with a brief introduction of how science may provide insight into “how” something can be done, the practice of science itself does not provide us with the ethics of “should” it be done. Review with students the process of creating genetically modified organism. Allow students to discuss their own feelings on the issue prior to reading the article or doing any research into the topic. Many students may have misconceptions that come to light during this discussion. Have students write their feelings allowing them to uncover their own misconceptions during their research. You as the instructor may want to make notes of any of these misconceptions do return to later in concluding the lesson to assure that the student has corrected them during their research.
- **Explore:** Direct students to read the article and to carefully consider both sides of the issue before proceeding on to the next phase of the lesson. Students should take notes as they are reading on the graphic organizer provided.
- **Explain:** Have students briefly discuss the notes taken from their reading. Ask if anyone has changed their point of view. Explain that this is a carefully debated issue in many parts of the world due to food shortages and concerns of local populations.
- **Elaborate:** During this portion of the lesson students are to write their own persuasive essay either for or against the use of genetically modified organisms. Students should provide at least three pieces of evidence in support of their stance on the issue. The opposing argument should also be addressed in the essay. Further internet research by the student will be required and students should be encouraged to use the “Debate over BT Corn” graphic organizer in completing their research. If students have not had practice in this type of writing the teacher may want to use the “Persuasive Essay Outline” with the entire class, otherwise it may be used for differentiation to scaffold those students who may have difficulty in preparing their paper.
- **Evaluate:** Students will be evaluated on their ability to support their particular stance on use of GMO’s with scientific data. Students will write a persuasive paper in support of their chosen stance on the issue. Students should be directed to use reliable sources in seeking support for their particular stance.

#### **Assessment:**

Use the grading rubric provided to assess student expectations for the persuasive essay.

#### **Modifications:**

Students may be allowed to present their essay to the class and if time allows the instructor may wish to allow students to conduct a class debate on the selected topic. Students may also be encouraged to share their essay in small group discussions or before the entire class.

**Alternative Assessments:** none

#### **Supplemental Information**

**Critical Vocabulary.** These are the terms with which students seem to have the most difficulty, since the English standard course of study emphasized etymology of word this information is provided where it could be found.

**ambiguous** - From the Latin *ambigere* "to be uncertain". Open or having multiple meanings.

**genetically modified organism** - An organism whose genetic characteristics have been altered using the techniques of genetic engineering.

**moratorium** – From the Latin *morari* "to delay". A suspension of activity:

**entomologist** - From Greek. *entomon* "insect" + *logia* "study of." A zoologist who studies insects.

**Comments:** A sample outline for a persuasive paper is provided to assist students in planning their paper.

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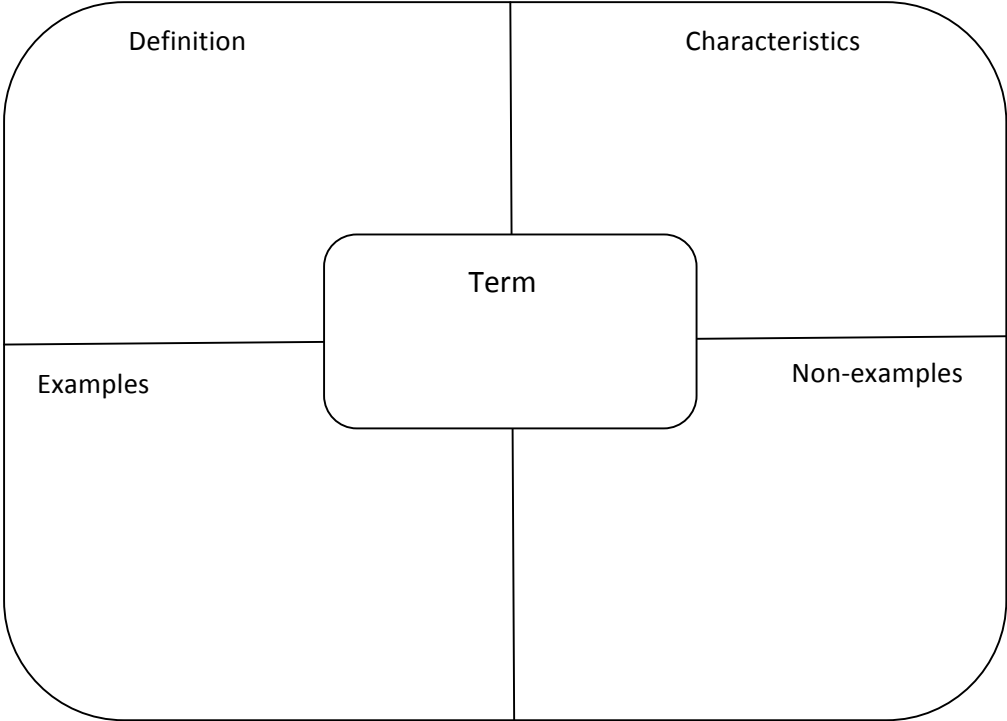
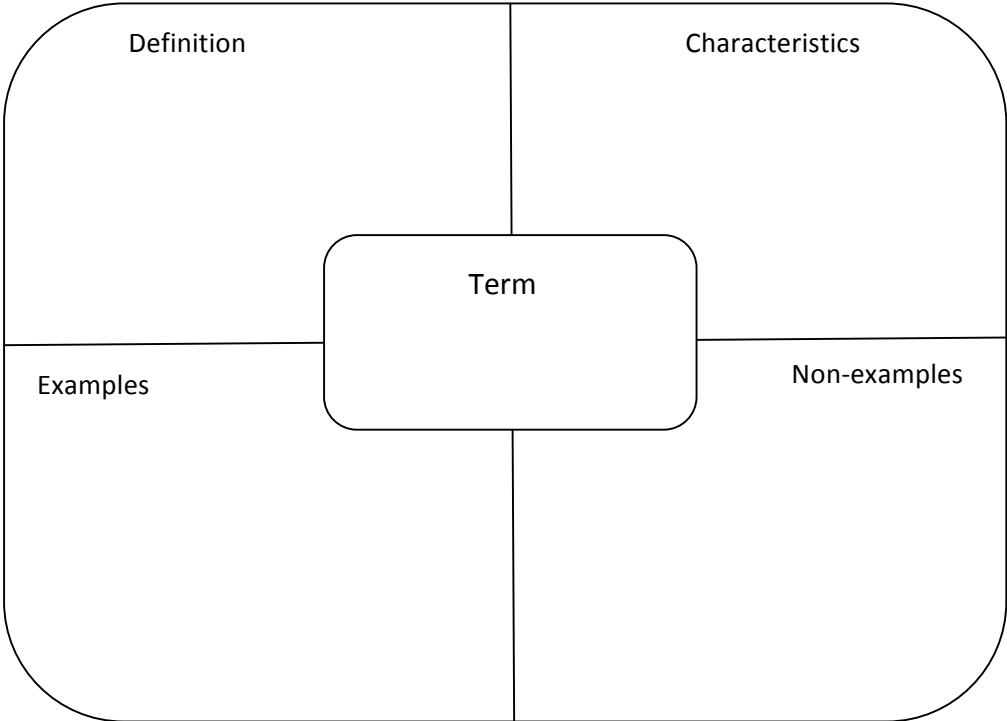
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### Scoring Rubric

Criteria	Needs Improvement 1	Poor 2	Fair 3	Good 4
<b>Introduction</b>	One of the four criteria from the good category has been met.	Two of the four criteria from the Good category have been met.	Three of the four criteria from the Good category have been met	Includes a hook to get readers attention; provides background information; 5+ sentences in length; Clear thesis statement
<b>First Argument</b>	One of the four criteria from the good category has been met.	Two of the four criteria from the Good category have been met.	Three of the four criteria from the Good category have been met	Topic sentence states the reason; Topic sentence clearly relates back to thesis; 5+ sentences in length; Elaboration back to reason is clear and persuasive
<b>Second Argument</b>	One of the four criteria from the good category has been met.	Two of the four criteria from the Good category have been met.	Three of the four criteria from the Good category have been met	Topic sentence states the reason; Topic sentence clearly relates back to thesis; 5+ sentences in length; Elaboration back to reason is clear and persuasive
<b>Third Argument</b>	One of the four criteria from the good category has been met.	Two of the four criteria from the Good category have been met.	Three of the four criteria from the Good category have been met	Topic sentence states the reason; Topic sentence clearly relates back to thesis; 5+ sentences in length; Elaboration back to reason is clear and persuasive
<b>Opposing Viewpoint</b>	One of the four criteria from the good category has been met.	Two of the four criteria from the Good category have been met.	Three of the four criteria from the Good category have been met	Topic sentence states the reason; Rebuttal is clear and makes sense; 5+ sentences in length; Elaboration back to rebuttal is clear and persuasive
<b>Conclusion</b>	One of the four criteria from the good category has been met.	Two of the four criteria from the Good category have been met.	Three of the four criteria from the Good category have been met	Paraphrase of main points; Restates thesis statement. Writer convincingly explains how they feel about the issue. Ends with a personal comment or call to action.
<b>Mechanics</b>	One of the four criteria from the good category has been met.	Two of the four criteria from the Good category have been met.	Three of the four criteria from the Good category have been met	Student writes in full sentences with appropriate punctuation; Student makes appropriate use of vocabulary; Student has three or fewer spelling errors; Student has 3 or fewer grammatical errors.

**Frayer Vocabulary Circles**



Barton, Mary Lee & Deborah L.Jordon. Teaching Reading in Science 2nd edition. Aurora: MCREL, 2001.

# Persuasive Essay Outline

## I. **Introduction:**

- A. Get the readers attention by using a hook.
- B. Give some background information if necessary.
- C. Thesis or focus statement.

## II. **First argument or reason to support your position:**

- A. Topic sentence explaining your point.
- B. Elaboration back to your point.

## III. **Second argument or reason to support your position:**

- A. Topic sentence explaining your point.
- B. Elaboration back to your point.

## IV. **Third argument or reason to support your position:**

- A. Topic sentence explaining your point.
- B. Elaboration back to your point.

V. **Opposing Viewpoint:** (This is optional, however highly recommended, so that the reader will know you have considered another point of view and have a rebuttal to it.)

- A. Opposing View to your argument.
- B. Your rebuttal to the opposing point.
- C. Elaboration to back your rebuttal.

## VI. **Conclusion:**

- A. Summary of main points or reasons
- B. Restate thesis statement.
- C. Personal comment or a call to action.

**The Debate Over Bt Corn  
Graphic Organizer**

Pros	Source of Information	Cons