

Course: Biology	Grade Level: 11/12
Type: Argumentation	Structure: Analysis
Teaching Task 2: Should industry continue to produce genetically modified crops for human use by utilizing genetic engineering? After reading several popular and scientific sources, write an essay that addresses the question and support your position with evidence from the text. Be sure to acknowledge competing views. Give examples from past or current events or issues to illustrate or clarify your position.	
Performance Level: Advanced	

### Genetically Modified Organisms

A genetically modified organism (GMO) is "a result of recombinant DNA biotechnological procedures that allow the genetic makeup of an organism to be modified" (Schneider, K. R., R.G. Schneider). In most cases, these modifications are made in order to improve the quality of the organism. Today, GMOs are a large part of everyday life, comprising a large portion of the food in the circulation. Despite their prevalence, there remains to be a worldwide controversy over the production of genetically modified foods. Critics claim that the food is unnatural and harmful to both the environment and the consumer. However, these critics are flawed in their reasoning. Genetically modified foods are increasingly useful to the community and should continue to be in production and distribution.

In genetic engineering, specific traits can be isolated in an organism's genome. This trait can then be copied and placed into other organisms, amplified, or turned off completely. Gene transferring allows the possibility of also transferring traits between entirely separate species (Jones, L. 1999). Food producers harness this technology to make their products resistant to diseases or insects, larger in size, or more abundant in quantity. After being tested, this food is then placed into markets around the world. "It has been estimated that 60 to 70% of food

products in retail stores already contain genetically modified ingredients" (Schneider, K. R., R.G. Schneider). This process allows the world's food supply to increase significantly. Without GMO production, the expanding world's population would run out of resources and starve (Pendrous, R. 2001). Also, without the production of GMOs, the price on food products would increase significantly and hinder the consumers (Kilman S., B. Tomson 2011).

One of the primary arguments against GMOs is that the genetic modification goes against nature. Critics claim that making these modifications is immoral because the producers are "playing God." They claim that naturally occurring changes either happen by chance or by a long process of evolution, and that scientists have no right to interrupt nature. Vegetarian critics also feel uneasy because part of the plants they eat may contain genes from an animal that would not have gotten into the plant naturally. However, scientists claim that genetically modifying foods is completely natural. The modification of plants has occurred throughout history and is the basis for agriculture. The only difference is the technology used to create that modification; the new method is merely more exact. Instead of crossing hundreds of genes, a single gene can be crossed. New genes are not being created, but simply transferred from one source to another. This modification may have eventually taken place by evolution; science is simply quickening the process (*Harvest of Fear* 2001).

Claims have been made that the production of genetically modified foods will hurt small farmers. In areas where genetically modified crops are most prevalent, farmers may need to produce their own GM crops in order to compete. However, producing the GM crops may be too costly for the farmers. The farmers may either not be able to afford the necessary tools, or the surplus of the GM crops would not be significant enough to balance the costs. Thus, the separation gap between the rich companies and the poor farmers would be widened. Also, critics argue that farmers in countries that do not even contain GM crops would be harmed because GM

companies would be able to import cheap produce into those countries. Yet, GM supporters claim that farmers can reap many benefits from GM food. A major issue for many farmers is controlling insects from harming their crops. Destruction of the crops from the insects can drastically harm the farmers financially. In the past, the farmers have sprayed harmful pesticides that not only kill the pest, but all other insects as well. However, GM crops can be modified to contain a natural pesticide. Thus, the plants are protected, and no innocent bugs are harmed. Other modifications can allow plants to withstand frost, therefore benefiting the farmers. Another beneficial aspect of GM crops for farmers is that the overall yield of the crops may be substantially larger. By producing more crops, the farmers can earn more money (*Harvest of Fear* 2001). Overall, GMOs benefit farmers.

Many ill-informed critics argue that GMO safety testing is inadequate and incorrect. They remark that many experiments performed to test GMOs are run without proper standard conditions and controls. For example, when GM tomatoes were tested on rats, the weight of the rats differed and not enough prior experiments were held. Similar claims were made concerning GM maize, potatoes, and rice. Therefore, some people do not trust that the products were safe, because they do not think the experimental results were valid (Pusztai, A. 2001). Despite the hesitation from some people, biotechnology products are overall tested to be extremely safe for consumers. "Biotech crops undergo more testing and oversight before commercialization than any other agricultural products, including conventional crops" (Monsanto 2011). The foods are carefully examined and approved by agencies such as the FDA, US Department of agriculture, and the EPA (Monsanto 2011). Therefore, the foods are tested under strict environments and proven to be safe for consumers.

Allegations made against genetically modifying food include statements asserting that the GM food may contain many health factors. Since many of the GM foods contain genes from an

entirely different organism, the chance of the food becoming an allergen significantly increases. If ingested, these allergens can produce life-threatening reactions. Notwithstanding the possibility of becoming an allergen, GMOs have been found to have health benefits. Some foods are made to be significantly lower in calories or fat. Thus, obesity can be reduced by eating GM foods. Also, by the plants containing natural pesticides, fewer fertilizers and pesticides will need to be used on the fields. Hence, the toxicity level would decrease. The GMOs would furthermore help with nutritional and medical problems in underdeveloped countries. Foods can be developed that contain essential vitamins and minerals or even vaccines to aid in the health of the societies. Prior to the GMOs, many people of such communities were malnourished and did not have access to the costly medications (*Harvest of Fear 2001*).

Finally, one of the major concerns about GMOs is the possibility of harming the environment. Mainly, the GMOs may harm other species. For instance, a conducted study showed that Monarch caterpillars were dying more rapidly when exposed to GM corn pollen than normal corn pollen. Although the results may have been inaccurate, the study caused much controversy. Also, researchers sometimes worry that the new organisms may become a "killer organism" and cause other naturally occurring species to die out. Conversely, GMOs actually improve the environment in many aspects. Primarily, the production of GMOs would greatly decrease the use of pesticides. Prior, the pesticides would administer toxins into the air, plants, soil, and surrounding water. With the use of the GMOs, the toxic substance would no longer be used as frequently and consequently improve the environment. Also, a large amount of the GMOs produced are sterile. Therefore, the probability of the species growing uncontrollably and endangering other species is highly unlikely (*Harvest of Fear 2001*).

Genetically modified organisms are highly beneficial and should be continued to be manufactured. Although there is much controversy over the GMOs, the positives greatly outweigh the negatives. GMOs naturally help farmers, personal health, the environment, and so much more. Without the use of GMOs, the world's food supply may eventually dwindle and the environment suffer. In conclusion, genetically modified organisms are extremely important and should be widely used throughout the world.

## References

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Annotation		
Focus	4	The writer addresses all aspects of the prompt in a clear and convincing way. The writer clearly states a position, acknowledges competing views and illustrates the position by making connections to current events and issues.
Reading/Research	4	The writer utilizes a variety of sources in support of the controlling idea. The writer's presentation of relevant research and detailed explanations lend credibility to the argument.
Controlling Idea	4	The writer establishes and maintains a substantive and credible claim in the thesis and throughout the essay: <i>Genetically modified foods are increasingly useful to the community and should continue to be in production and distribution.</i> Counter claims are also presented in a fair and credible manner.
Development	4	The writer presents thorough and detailed examples through the synthesis of relevant readings. The points made clearly support the argument: <ul style="list-style-type: none"> <li>• <i>This process allows the world's food supply to increase significantly.</i></li> <li>• <i>Foods can be developed that contain essential vitamins and minerals or even vaccines to aid in the health of the societies.</i></li> </ul>
Organization	4	The organization is sophisticated and enhances the development of the writer's reasoning. Each paragraph begins with the counter claim and resolves to the writer's claim.
Conventions	3.5	The writer demonstrates a strong command of Standard English. The tone of the piece is clearly argumentative: <i>Critics state... Conversely, GMOs actually improve the environment ...One of the major concerns.</i>  Citations are noticeably absent from the paragraphs on genetic modification not being natural and its impact on small farmers. These citations are relegated to the ends of the paragraphs.
Content Understanding	4	The writer demonstrates an in-depth understanding of biotechnology. The content is relevant, accurate, integrated throughout the writing and clearly supports the controlling idea.

**This student would benefit from feedback, discussion, and/or instruction in the following areas:**

- Further instruction regarding appropriate use and format of citations