OMG or GMO?

Objective:

Discover that one of the applications of biotechnology has created issues of genetic modified organisms (GMOs) and genetically modified (GM) foods.
Identify advantages and disadvantages of GMOs and GM food.

Keywords:

- Genetic modification
- GMO
- Genes

21st Century Skills Represented:

- Environmental, Economic, Business, Civic, Information & Media Literacy
- Global Awareness
- Critical Thinking & Problem Solving
- Communication
- Information, Media & Technology Skills
- ICT Literacy
- Social and Cross-Cultural Skills

National Science Education Standards:

- Earth & Space Sciences: Earth & Human Activity
- Engineering, Technology & Applications of Science: Links Among Engineering, Technology, Science & Society

Background

OMG! There is so much written about GMOs! What should you read? Who do you believe? Many sources provide lots of opinions about genetically modified organisms (GMOs). Who is right? What are the facts?

Things to consider: Biotechnology is the science; recombinant DNA is the technology; gene transfer is one of the processes. The timeline of biotechnology is relatively new. Scientists, or genetic engineers, have been conducting research in a broad range of biological sciences including biochemistry, botany, embryology and microbiology. They have developed techniques with numerous important applications in the fields of medicine, agriculture and animal husbandry.

Related to agriculture, the science of biotechnology and genetic modification is used to improve crop characteristics for food and nutrition content, for environmental protection, and also for bioproduct feedstock enhancement. Just as soybeans that produce oil lower in saturated fat are more valuable to the food processing industry, so are soybeans that produce higher oil content to those industries that process soybean oil for fuel production or polyols for soy plastics. Both feedstock improvements have resulted from genetic modifications in soybeans.

Do your homework. Consider the source. Use current information. This is one science that is developing rapidly. There are many points of view, and this is a global issue. Stakeholders such as farmers, research specialists, agriculturally-related processors and consumers all need valid information. You will need information on the following risks and benefits:

- **Benefits:** greater yields, improved environmental outcomes, less pesticides, increased farming efficiency, healthier animals, improved nutrition in food, feedstock enhancements for specific uses

- **Risks:** insect and disease resistance, allergic reactions, antibiotic resistance, cross pollination and others

Materials

- Internet access

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Pre-Lab Preparation

1. Have students conduct research and answer the following questions:
    a. What is a GMO?
    b. What is GM food?
    c. How can GMO technology be used to make better products?
    d. What are the benefits of GMO's and GM food?
    e. What are the disadvantages of GMO's and GM food?
2. Hold a class discussion on the questions and their answers.

Lab Procedures

1. Separate the class into two teams. One team will represent those for the use of GMO's and GM food, and the other team will represent those against the use of GMO's and GM food. Students can be assigned to teams or randomly draw teams.
2. Have each group create their own webpage. This webpage should be aimed at educating other students and the public on their stance concerning the use of GMO's and GM food. Students can use wiki sites such as www.wikispaces.com or www.pbwiki.com to create their own webpages.

Post-Lab Discussion

1. Have each group choose one person to represent their stance in a class debate.
2. Hold a class debate on the topic of using GMO's and GM food.
3. This debate should be highly structured and include opening arguments, rebuttals, and closing arguments.
4. Have the students not participating in the debate (the audience) write questions that come up during the debate.
5. Have the audience give you their questions and hold a class discussion over them.

Expansion Ideas

- Have students compare and contrast samples of GM foods and non-GM foods.
- Host a GMO forum for the school during lunch where students and faculty can watch the debates and gain information about GMO's.
- Consider the impact/potential impact that GM crops may have on world hunger.
- Expand the discussion to cover advantages and disadvantages of GMOs on the environment.
- Trace the developments of GM varieties of corn, soybeans and cotton in the last 10 years. What stackable traits will be on the market in the next few years?
- How has GM trait development impacted the bioenergy and bioproduct industries?

Evaluation of Learning

- Students were able to successfully create a coherent and organized webpage that showed thorough investigation and presentation of their side of the issue.

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Resources

- Websites and Articles
  - GetBiotechSmart from United Soybean Board
  - Biotechnology from United States Department of Agriculture
  - Fourth Wheat Summit Promotes Research, Biotech, Industry Dialog from Corn & Soybean Digest
  - The Ohio Plant Biotechnology Consortium

Contacts

- Ohio Agricultural Research and Development Center, Wooster, OH: http://oardc.osu.edu/
- Pioneer, A Dupont Business, Delaware, OH: http://www.pioneer.com
- Ohio Ecological Food and Farm Association, Columbus, OH: http://www.oeffa.org/

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