Biotechnology in the Media

Introduction

For centuries humans have modified plants for special uses. Biotechnology today offers more efficient and precise methods of genetic modification to develop useful plant characteristics. Though the human benefits of genetic modification are clear, it is not always easy to understand what biotechnology is and what genetically modified organisms are. Some media sources present scientifically tested, peer reviewed information and other media sources present untested or opinion-based information. It is important to know how to tell the difference and to identify a media source's intent when evaluating the reliability of information.

Grades: 6-8
Time Needed: One, 45-min class period

Learning Objectives:

After completing this lesson, students will be able to:

1. Define what biotechnology and genetically modified organisms are
2. Identify sources that are peer-reviewed and appropriate to use as scientific evidence
3. Compare and contrast between positive and negative views on biotechnology

Materials:

- ☐ Biotechnology Pro and Con Statements (1 per group of 2-4 students)
- ☐ Website Resource list (1 per student or group)
- ☐ Using Research and Evidence worksheet (1 per student)

Next Generation Science Standards (NGSS)

As a result of activities in grades 6-8, all students should master:

Topic

- **LS2:** Growth, Development, and Reproduction of Organisms
- **ES5:** Human Impacts

Performance Expectations

- **MS-LS1-3:** Use argument supported by evidence for how an organism is a system of interacting subsystems composed of groups of cells.
- **MS-ESS3-4:** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Dimension

Practices:

- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Disciplinary Core Ideas:

- **LS1.A:** Structure & Function
- **ESS3.C:** Human Impacts on Earth Systems

Cross-Cutting Concepts:

- Cause & Effect
- Stability & Change

Instructional Process

1. Ask students what they think biotechnology and genetically modified organisms are. Follow-up asking how they know that, where did they learn that information.
2. Pass out the cut-up list of Biotechnology Pro and Con Statements and have students sort the statements into pro and con lists. Check the lists to confirm students have them correctly sorted.
3. Discuss with students that some of the statements are science facts that have been researched and checked, while others are just opinions put on the Internet with no science behind them. Ask students which statements they think are backed by science and why.
4. Using the resource list and the Using Research and Evidence guidance, students should go to the websites to judge if they are credible sources or mostly opinions. Using this knowledge they should try to find the three statements that are not credited to eliminate.
5. Have students pull out the 3 statements that are not credited sources. Have them discuss how this changes their view on biotechnology and what those statements say.
6. Using the credited sources, students should come up with their own definitions of what biotechnology and genetically modified organisms are. Share these definitions with the class to come up with one set of definitions that all students can agree on.

Modifications

For high school students:

- Have small groups of students pull 2-4 statements of pros and cons both credited and not, to use in addition to the given statements. Have them site their sources. Rotate sentences and sources around the room to research if the sites are credited or not. Use larger list and eliminate not-credited sources before coming up with what biotechnology and genetically modified organisms are.

For elementary students:

- Simplify statements by making sure vocabulary is at appropriate levels. Read through each statement as a class and look at the website it came from. Judge together if the statement is backed by science or opinion and use only credited statements to sort into pros and cons.

Differentiation in the 6-8th grade classroom

For advanced learners:

- Let students work only in pairs or sort statements individually
- Have them draw a picture to illustrate their definition of biotechnology and genetically modified organisms

For struggling learners:

- Discuss and write out definitions of confusing and challenging vocabulary words from statements
- Add pictures to statements
- Simplify/shorten statements

Sources

Statements:

https://www.basf.com/en/company/research/our-focus/plant-biotechnology.html

http://www.gmo-compass.org/eng/agri_biotechnology/sustainability/

http://ccr.ucdavis.edu/biot/benefit_new.html

http://www.raw-wisdom.com/50harmful

http://www.foe.org/projects/food-and-technology/blog/2012-04-bioeconomy-blueprint-or-biotechnology-boost

http://www.monsanto.com/newsviews/Pages/food-safety-science.aspx

Using Research and Evidence:

http://owl.english.purdue.edu/owl/resource/588/02/

Biotechnology Pro and Con Statements

Directions

1. Copy the following statements and cut them apart, enough for a set for each group (2-4 students).
2. Make sure to mix up the statements before passing them out to each group to sort.

Statements:

Pros –all credited

- Genetic engineering is concerned with the targeted modification of the genetic material of bacteria or plants, for example to stimulate them to make desired products. Today genetic engineering is primarily used in the field of medicine, but is also applied in industry and agriculture. ~BASF, The Chemical Company
- Biotechnology enables food products to be produced in ways that save resources. It thus contributes to a sustainable economy. ~BASF, The Chemical Company
- Most currently grown genetically modified crops were not originally designed to protect farmland or environmental resources. However, the way they have changed some crop production practices may contribute to more sustainable land use in the long term. ~GMO Compass
- Today, there are newer, more precise methods of genetic modification that are being used to introduce diverse beneficial characteristics including better tasting fruits or vegetables that retain their flavor and texture longer. ~Center for Consumer Research, U.C. Davis
- Another benefit of biotechnology is creating plants that are resistant to viruses and containing their own built-in pest resistance traits allows fewer pesticides to be applied to fields. ~Center for Consumer Research, U.C. Davis

Cons-credited

- It is well-recognized that absolute safety is not an achievable goal in any human endeavor, and this reality is relevant to food and feed safety. The safe use of food or feed has typically been established either through experience, based on its common use, or in more recent times by application of generally recognized scientific assessment measures. ~Monsanto.com
- The safety assessment of genetically modified plants and derived food and feed follows a *comparative* approach, *i.e.* the food and feed are compared with their non-genetically modified counterparts in order to identify intended and unintended differences which subsequently are assessed with respect to their potential impact on the environment, safety for humans and animals, and nutritional quality ~2008 European Food Safety Authority

Biotechnology Pro and Con Statments

Cons-not credited

- Biotechnology is undoubtedly the single most potent technology the world has ever known - more powerful even than atomic energy. Yet it is being released throughout our environment and deployed with superficial or no risk assessments - as if no one needs to worry an iota about its unparalleled powers to harm life as we know it - and for all future generations. ~Nathan Batalion, ND
- What's wrong then with the "advance" of genetic engineering? No doubt, with hybridizations conscious life is manipulated. The implication is that biotechnology involves vital moral issues in regard to the whole of life in nature. ~Nathan Batalion, ND
- Biotechnology is an extreme form of genetic engineering involving the writing and rewriting of genetic code and biological systems in order to create novel organisms that have never existed before in nature. Novel organisms created through synthetic biology could escape from the lab and become a new class of invasive species or pump out oil into local waterways. Biotech workers are put at risk if organisms are improperly contained and these synthetic bugs get inside their bodies or are carried home with them on their clothes. ~Eric Hoffman

Using Research and Evidence

http://owl.english.purdue.edu/owl/resource/588/02/

What type of evidence should I use?

There are two types of evidence:

1. First hand research is research you have conducted yourself such as interviews, experiments, surveys, or personal experience and anecdotes.
2. Second hand research is research you are getting from various texts that have been supplied and compiled by others, such as books, periodicals, and websites.

Regardless of what type of sources you use, they must be credible. In other words, your sources must be reliable, accurate, and trustworthy.

How do I know if a source is credible?

You can ask the following questions to determine if a source is credible:

Who is the author? Credible sources are written by authors respected in their fields of study. Responsible, credible authors will cite their sources so that you can check the accuracy of and support for what they've written. (This is also a good way to find more sources for your own research.)

How recent is the source? The choice to seek recent sources depends on your topic. While sources on the American Civil War may be decades old and still contain accurate information, sources on information technologies, or other areas that are experiencing rapid changes, need to be much more current.

What is the author's purpose? When deciding which sources to use, you should take the purpose or point of view of the author into consideration. Is the author presenting a neutral, objective view of a topic? Or is the author advocating one specific view of a topic? Who is funding the research or writing of this source? A source written from a particular point of view **may** be credible; however, you need to be careful that your sources don't limit your coverage of a topic to one side of a debate.

What type of sources does your audience value? If you are writing for a professional or academic audience, they may value peer-reviewed journals as the most credible sources of information. If you are writing for a group of residents in your hometown, they might be more comfortable with mainstream sources, such as ***Time*** or ***Newsweek***. A younger audience may be more accepting of information found on the Internet than an older audience might be.

Be especially careful when evaluating Internet sources! Never use Web sites where an author cannot be determined, unless the site is associated with a reputable institution, such as a respected university, a credible media outlet, government program or department, or well-known non-governmental organizations. Beware of using sites like Wikipedia, which are collaboratively developed by users. Because anyone can add or change content, the validity of information on such sites may not meet the standards for academic research.