GMO's

Student Learning Targets:

» Students will define the term GMO.
» Students will compare and contrast selective breeding and genetic engineering technologies.
» Students will identify products produced as a result of genetic engineering.
» Students will explain the structure of DNA.
» Students will identify the social, economic and environmental benefits and potential concerns for the utilization of genetically modified organisms (GMOs).
» Students will identify the commercially available GM crops on the market.
» Students will identify and describe the three strategies that help reduce the possibility of resistant weeds and pests.
» Students will explain how genetically modified organisms are monitored by government agencies.

Supplies:

Quantity:	Item:
	Powerpoint
	Flipchart papers (regular paper could also work)
	Post-it Notes
	Markers
	Golden Rice Case Study (cut out different perspectives)

Overview:

» Introduction and Anticipatory Set
  • Genetically Modified What?: GMO Video
  • Questions and Answers: Large Group Discussion
  • Introduce the lesson's roadmap
» Teaching and Main Activities
  • Presentation of Core Material
  • PowerPoint Presentation
  • Discussions Embedded Throughout
  • Race to Write
  • Stool Stigma

Introduction and Anticipatory Set:

» Genetically Modified What? GMO Video
- Student Learning Target
  - Students will define the term GMO.
- Context and Description
  - Watch this video (4:10) to introduce GMOs.
- Assessment or Questions
  - After the video, engage students in the following questions as an informal check-in.
    - What is a GMO?
    - Does the public seem to understand what GMOs are, or what the acronym stands for?
    - Is it important to be educated on issues before taking a stance, why or why not?
  - *Connection:* It takes several hours to record a "man on the street" like the video here. Many people decline and many people do actually know what GMOs are. However people on social media, on both sides of the GMO debate, tend to share their opinions on social media. Sometimes they understand GM and sometimes they don't.
    - Have you ever seen a controversial post on social media? What did it say?
    - Have you ever seen a post about GMOs on social media? What did it say?
    - How might we respond to a controversial post without "escalating" the situation?

Teaching and Main Activities:

» Presentation of Course Material
- Student Learning Targets
  - Students will compare and contrast selective breeding and genetic engineering technologies.
  - Students will identify products produced as a result of genetic engineering.
  - Students will explain the structure of DNA.
  - Students will identify the social, economic and environmental benefits and potential concerns for the utilization of genetically modified organisms (GMOs).
  - Students will identify the commercially available GM crops on the market.
  - Students will identify and describe the three strategies that help reduce the possibility of resistant weeds and pests.
  - Students will explain how genetically modified organisms are monitored by government agencies.

- Context and Description
  - Share the material found in the presentation.
- Assessment or Questions
  - Informal Discussions
    - There are some prompts and probes throughout the presentation for students to respond to individually or as a large group.
- Tips and Tricks
  - Try to be energetic and liven up the mood; this can be a dense subject.
    - Consider splitting up the content over a few days for some classes.
  - Do not take a stance!
    - Consider splitting up the content over a few days for some classes.
  - Provide students with the facts (and both sides to the stories and cases) and do not side with anything until after the course ends, even if asked about your personal opinions.

» Social Media Practice
  - Student Learning Targets
    - Students will define the term GMO.
    - Students will compare and contrast selective breeding and genetic engineering technologies.
  - Context and Description
    - Provide students with 2 post-it notes. On each post-it note, students should write:
      - 1 brief (2-3 sentences) Facebook post that compares and contrasts selective breeding and genetic engineering.
      - 1 tweet or Instagram post that highlights one of the historical mile markers in GMO history.
    - Peer Review
      - Students can form small groups and write comments or leave "likes" on the back of each post it note.
      - Students can participate in a gallery walk where they randomly select a variety of their classmates' posts to like and comment on.
    - Assessment or Questions
      - Why is social media use so important for AFNR?
      - What did we learn about GMOs through this activity?
    - Tips and Tricks
      - Have students hang up their posts.
      - Students can "like" or "comment"

- » Presentation of Course Material
  - Student Learning Targets
    - Students will identify the social, economic and environmental benefits and potential concerns for the utilization of genetically modified organisms (GMOs).
  - Context and Description
    - Divide students into six groups. Assign each group to research the pros and cons of GMOs from one of the three legs of the sustainability stool (social, economic and environmental).
    - Each group should write out their pros and cons list on flipchart paper or on sticky notes to share with the class.
    - Have students cite specific statistics, examples, etc.
  - Assessment or Questions
    - What is your personal definition of sustainability? What does that mean to you?
    - What makes a practice sustainable?
    - Were the pros and cons from your peers convincing? Why or why not?
      - What made them convincing or not as convincing (statistics, visuals, preparedness examples, etc.)?
    - What did we learn through this activity?
  - Tips and Tricks
    - Again, make sure to monitor how students are doing. This is meant to be a low-stress and fun activity to introduce the idea of sustainability.
      - Be on the lookout for all students being actively engaged and not passive.

Wrap Up:

- » Golden Rice Case Study
  - Student Learning Targets
    - Students will identify the social, economic and environmental benefits and potential concerns for the utilization of genetically modified organisms (GMOs).
  - Context and Description
    - Form teams of 4 students. Each team will be given a list of facts about golden rice. Complete the following steps, as outlined on the case study instructions.

- Step 1 (10 minutes): Form teams of 4 students. Each team will be given a list of facts about golden rice. Some teams will be given facts that support the pro position (Golden Rice is a good strategy for alleviating vitamin A deficiency in developing nations), and some team will be given facts that support the con position (Golden Rice is not an effective means of addressing the vitamin A deficiency in developing countries). Students will have 10 minutes to review this information and organize their thoughts.
- Step 2 (10 minutes): In the student teams, students will develop social media messages that communicate their assigned side (pro or con) of the Golden Rice debate. Guided by social media best practices, students will develop two (2) social media posts for each platform (Facebook, Twitter, Instagram). Thus, students will develop 6 posts in total.
- Step 3 (5 min): Each 4-person team will be split in to 2, 2- person teams and will be paired with 2 other students who had an opposing side. Social media posts defending their sides will be shared.
- Assessment or Questions
  - What are some of the key benefits of golden rice?
  - What are some of the drawbacks of golden rice?
  - What did we learn about GMOs in general through this activity?
  - How can we apply this knowledge to the production of other agricultural products utilize GMOs?
- Tips and Tricks
  - Be prepared to define key terms—some of the vocabulary in this activity is advanced.
  - Some additional content instruction may be needed depending on the grade level or knowledge level of the students in the class.