

Digital Literacy and GMOs

Troy Hall, Forest Ecosystems and
Society

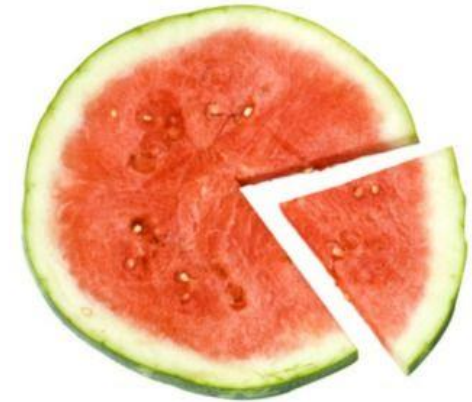
Betsy Emery, Graduate Research
Assistant

Jay Well, SMILE

August 2018

Today's Agenda

- Session Overview - Jay
- Introduction - Betsy
- Where We've Been – Jay and Betsy
 - Spring 2018 Teacher Workshop, Surveys, and Focus Groups - Jay
 - What We Learned and How It Connects – Betsy
- Where We Want To Go - Jay
 - Aug 2018 - Winter 2020 Plan - Jay
- The Lessons – Jay and Betsy
 - <https://tinyurl.com/y8ym73x2>
 - Fact Checking in an Era of Fake News - Jay
 - Nature of Science - Jay
 - Methods of Food Modification - Jay
- Looking Forward - Betsy



**Seedless watermelons
aren't GMOs.**



**But rainbow
papayas are.**



**So are cotton
t-shirts!**

You come across GMOs every day.
Learn more about them
at GMOAnswers.com



Meet Betsy

- B.S. Forestry, Northern Arizona University, 2014
- Established City of Flagstaff's Open Space Program, 2014 -2018
- M.S. Forest Ecosystems and Society Candidate, Oregon State University
- Career interests include: Community conservation, science communication, and environmental policy
- Personal interests include: Hiking, backpacking, and travelling

What we want you to Know

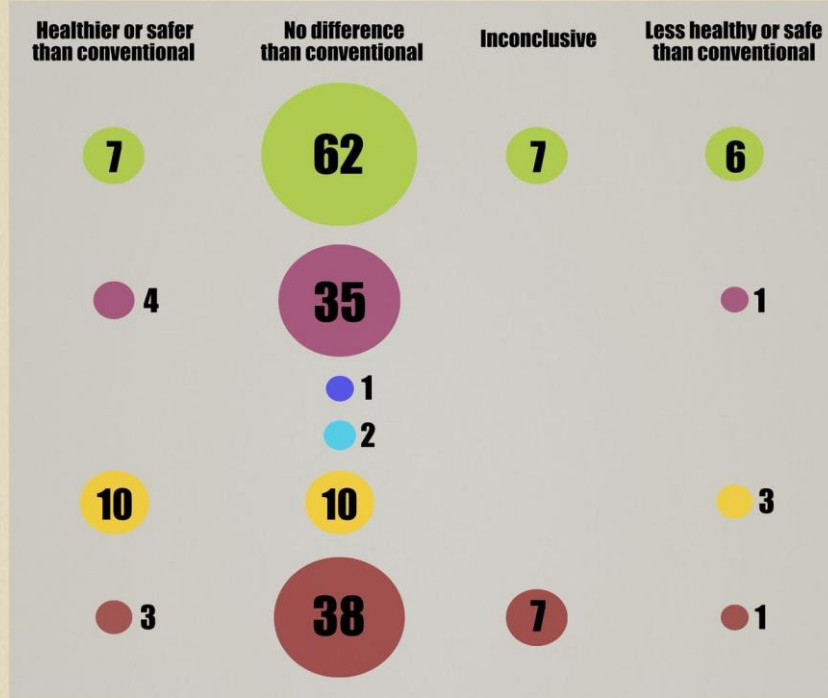
1. We have been listening to you
2. We have a long term curriculum plan
3. You are our partners in this—we need your feedback!!



Key Themes from Focus Groups and Surveys

The scientific literature on GMO safety for human consumption

Are GMOs safe to eat and is the research only funded by the industry?



- Government-funded studies
- Industry-funded studies
- Competing industry-funded studies
- Independent NGO-funded studies
- Studies with mixed funding
- Studies without funding information

Data from the GENetic Engineering Risk Atlas (GENERA), showing 197 peer-reviewed scientific studies that address the safety of genetically engineered foods out of 400 randomly selected for the beta release of the Atlas.

Visit genera.biofortified.org for up-to-date information. Information presented in this graphic is accurate as of August 2014.

GENETIC LITERACY PROJECT
WHERE SCIENCE TRUMPS IDEOLOGY

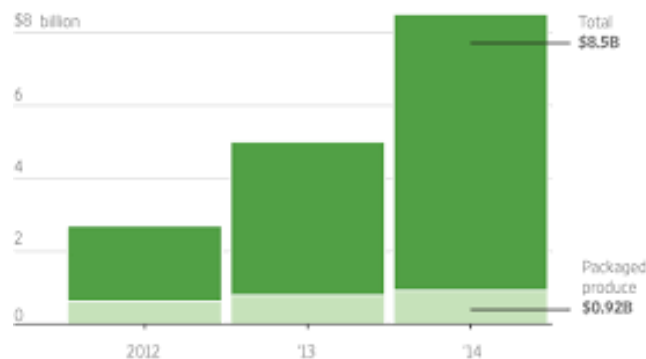
BIOLOGY FORTIFIED

- Majority of teachers do not feel they are very knowledgeable in genetic technologies or the issues associated with GM foods, affecting their confidence in teaching these types of lessons.
 - Curriculum guides will include significant background information and links to additional resources.
- Teachers already incorporate socially controversial materials into their classrooms and employ multiple tactics to help students engage.
 - Curriculum will use a variety of teaching techniques to further enhance student understanding and engagement.
- Students have difficulty understanding what credible sources are.
 - Curriculum includes 1 lesson specifically focused on assessing web-based information for its credibility, which will be built upon in upcoming case studies.

Key Themes from Focus Groups and Surveys



Growth in non-GMO Project verified sales



Source: SPINS

- Time is a major constraint both in finding/developing appropriate materials and adequately covering the details of the topic and positions.
 - Materials will be comprehensive: multiple activities with resources identified, optional extensions, and applicable standards.
- General consensus that most students have a vague idea of what GMOs are, but do not understand the details of the issue or have a strong stance.
 - Case studies will provide opportunities for students to learn about GM technologies, applications, and implications.
 - Research is focused on how students think about the topic, not whether they know the details.
- Overall concern about the feasibility of growing plants and spraying roundup in a school setting.
 - Investigating alternative hands-on activities for case studies.

Where We Are Going

- August 2018: TWS - Digital Literacy Curriculum
- January 2019: TWS - Argumentation and Case Study 1 Curriculum
- January - April 2019: Club Observations and Surveys
- April - May 2019: MS/HS Challenge and College Connection
- August 2019: TWS - Argumentation and Case Study 2 Curriculum
- September - November 2019: Club Observations and Surveys
- January 2020: TWS - Final feedback and Content Delivery
- Throughout this time, there will be a series of surveys to measure changes in student beliefs and gather feedback from teachers about the effectiveness of these lessons. These evaluations are still being developed.



Curriculum Overview

- 3 independent lessons that directly relate to NGSS
 - Fact Checking in an Era of Fake News
 - Nature of Science
 - Methods of Food Modification
- Foundational skills that we will build upon in the upcoming case studies and curriculum
- A mixture of stand-alone activities and options for scaffolding up and down, depending on the context
- Please provide us with any feedback you have as we demonstrate these lessons



Fact Checking in an Era of Fake News

- Goal: Students will learn how to evaluate a variety of web-based sources of information for their credibility using a modified version of the CRAAP Test (originally developed by CSU Chico).
- Goal for this activity is not to become an expert in the content of your source, but to assess it for its credibility to determine whether you should invest time in reading it.
- Create opportunities for students to engage in conversation about their beliefs with peers that may have different opinions.
- Getting Started: What does the term "fake news" mean to you?
 - Video: [How False News Can Spread – Noah Tavlin](#)



Fact Checking in an Era of Fake News

- Procedure:
 - Stanford History Education Group Assessments
 - [Claims on YouTube, Evaluating Wikipedia, Claims on Twitter, Website Reliability](#)
 - Do you think this is a credible source? Why?
 - Discuss additional SHEG assessments in small groups of 3-4
 - Introduce the CRAAP Test as one way to assess the credibility of information or a source
 - *Currency*: the timeliness of the information
 - *Relevancy*: the importance of the information for your needs
 - *Authority*: the source of the information
 - *Accuracy*: the reliability, truthfulness, and correctness of the information
 - *Purpose*: the reason the information exists

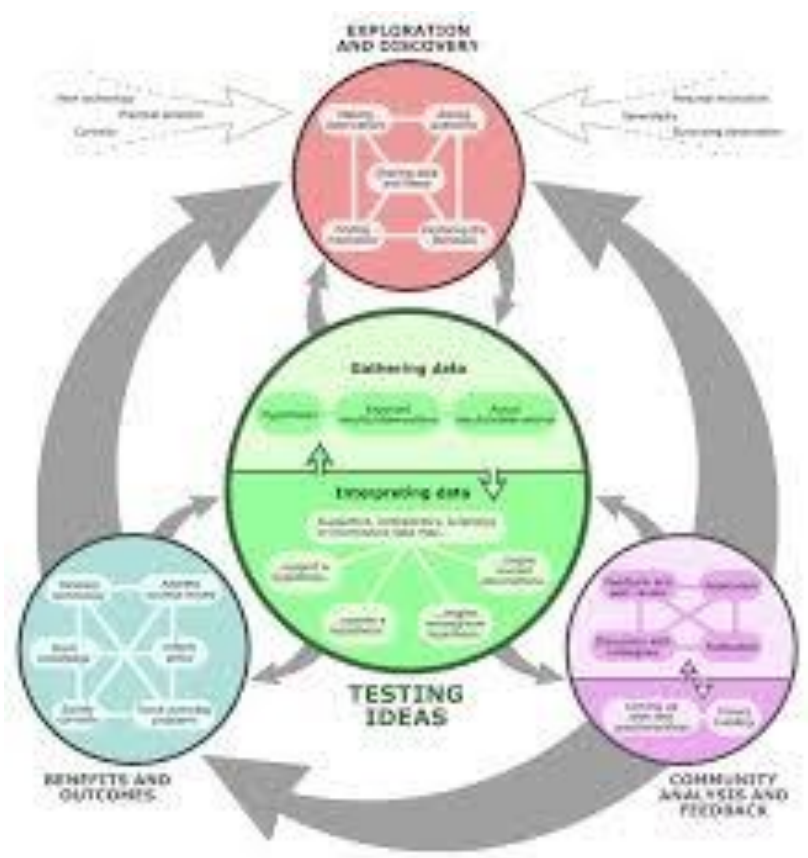


Fact Checking in an Era of Fake News

- What are the limitations of checklists like the CRAAP Test?
- Who is responsible to fact check information: the producer or the consumer?
- What are the consequences if you do not fact check information?
- What other subjects could you use these lessons with?
- Do you have any suggestions or changes that could make the lesson stronger?



Nature of Science



- Goal: Address the multiple misconceptions students have about the nature of science and help students understand how science happens, as opposed to memorizing the end-products or results.
- Lesson includes 3 small activities that can be used as stand-alone activities or coupled together to fill an entire class period.
- Getting Started:
 - Using Science in Your Everyday Life

Nature of Science

- Procedure:
 - Puzzle Activity
- Social Nature of Science Activity
 - Independently complete the "Statements About the Social Nature of Science"
 - Discuss your answers with your neighbor
 - Continuum from "Strongly Disagree" to "Strongly Agree" along the wall
 - After reading each statement, stand at the point along the continuum that corresponds to how you feel about the truthfulness of the statement
 - One person from each side of the spectrum to share why they feel the way they do



“ At the heart of science is an essential balance between two seemingly contradictory attitudes—an openness to new ideas, no matter how bizarre or counterintuitive they may be, and the most ruthless skeptical scrutiny of all ideas, old and new. This is how deep truths are winnowed from deep nonsense.”

- Carl Sagan

Nature of Science

- Discussion Questions:

- How does the puzzle activity relate to actually "doing science"?
- Add one statement to the "Statements About the Social Nature of Science" sheet and answer it.
- Is there anything missing from this activity or edits you think should be made?

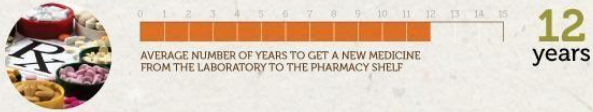
TIME TO MARKET PRODUCT COMPARISON

Compared to most products, new GM seed varieties take much longer to bring to market. It requires at least 13 years of research and development, as well as regulatory approvals for new GM seeds to be introduced.

GM Seed Variety¹



Pharmaceutical Medicine²

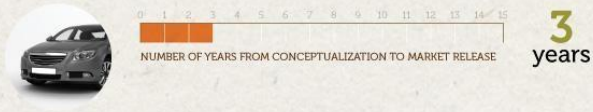


Boeing 787 Dreamliner Aircraft³



Image from: <http://www.boeing.com/boeing/commercial/787/family/>

Automobiles⁴



Heinz New Ketchup Packets⁵



Image from: <http://www.heinzdipansqueeze.com/>

XBOX 360⁶



Image from: <http://www.xbox.com/en-US/xbox/360/why-xbox-360?x-shellinar>

SOURCES

- ¹ Philip McDougall, "The cost and time involved in the discovery, development and authorization of a new plant biotechnology derived trait," September 2011.
- ² <http://ca.biomed.org/pdf/media/11/fact-sheets/11bradriggleveg.pdf>
- ³ <http://aardalnews.com/fin/boeingprograma/2008/09/04/2011news13.html>
- ⁴ <http://www.es.ora.com/Automobile-Design-How-long-does-it-take-to-develop-a-car-design-from-scratch>
- ⁵ <http://online.wsj.com/news/articles/SB100042420318904960431657869101218606>
- ⁶ <http://www.thefreebrary.com/Xbox-360--Gaming-2e/defined-ac0107864285>

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U.S. Farmers & Ranchers Alliance
www.FoodDialogues.com

Methods of Food Modification

- Goal: Introduce students to the multiple ways foods have been or can be modified, either naturally or with human intervention, including natural selection, selective breeding, induced mutations, genome duplications, and gene editing.
- Getting Started:
 - In what way would you want to modify a plant you eat?

Methods of Food Modification

Procedure:

1. Pass out *Crop Modification Technique Introduction Cards* – one card for each student.
2. There are three types of cards: the term, definition, and a graphic associated with each method. Discuss the cards with your classmates to find the matching term, definition, and graphic. Stand together as a group.
3. Each group will share their outcomes and the process that led them to believe they were a group.
4. Pass out the associated *Crop Modification Technique Fact Card* to each group (e.g. Natural Selection fact card to the Natural Selection group).
5. As a group, review the fact card and brainstorm a list of advantages and considerations that may be associated with your method.
6. Each group will share their list of potential advantages and considerations to the class.
7. As a class, discuss the benefits and potential drawbacks of each plant modification method and emphasize that a variety of these methods can be used simultaneously.



Methods of Food Modification

Discussion Questions:

- What is the responsibility of society in influencing how foods are modified?
- Why is there more controversy in food modification than in the production of medicine when they use many of the same techniques? (Example—Artificial insulin was first produced by Genetech in 1978 using GMOs)
- Is there anything missing from this activity or edits you think should be made?

Looking Forward

- Building student argumentation skills through subsequent case studies.
- Next set of curriculum will include a lesson about argumentation and a case study related to genetic modification (January 2019)
- Trying to move students from [this](#)...to [this](#) using [Toulmin's Model of Argumentation](#).



Questions?

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