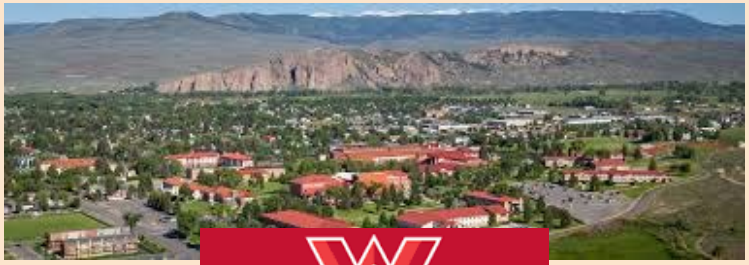
Inquiry Teaching and Learning From a Distance

Matt Oney

- Background
  - Bachelor’s Degree in Ecology and Environmental Biology
  - Master’s Degree in Plant Molecular Biology
  - W.K. Kellogg Woodrow Wilson Teaching Fellow (2012 Cohort)
  - Master’s Degree in Teaching and Curriculum



Western State Colorado University
Learning, Elevated.

THE WOODROW WILSON
National Fellowship Foundation
Change the world by changing theirs. TEACH.

Escanaba, MI - Upper Peninsula

- 2500 Students
- Rural
- Economically stressed
- Large areas without broadband internet access

Pandemic Plan

523
Chromebooks

101 Verizon
JetPacks

2 External WiFi
Locations


SCIENCE

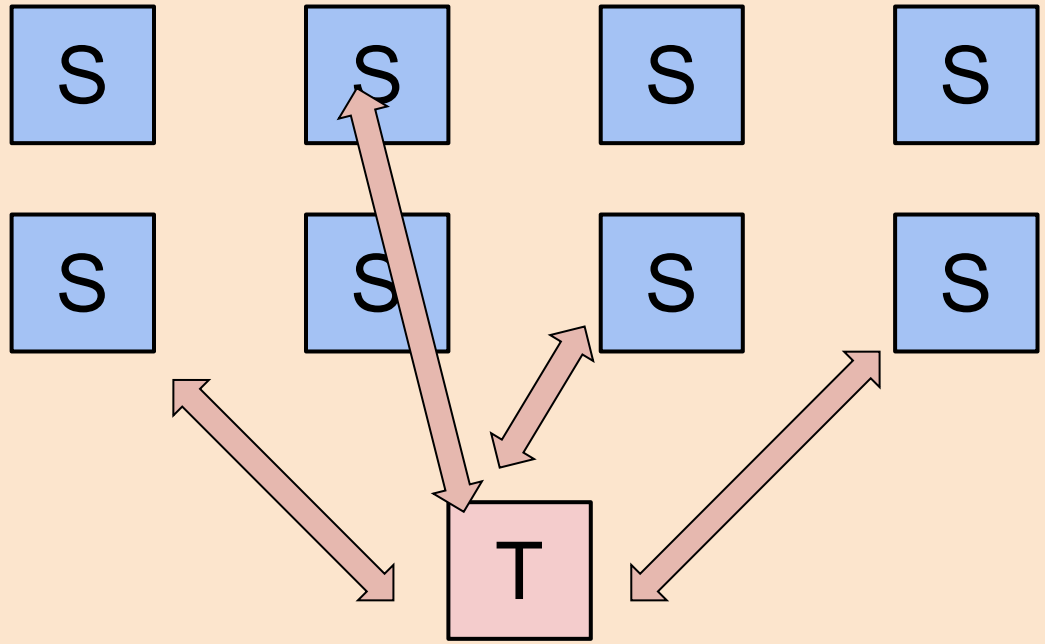
Scientists	Students
Creating	Consuming
Exploring	Watching
Discovering	Verifying
Reasoning	Recalling

Teaching ≠ Explaining

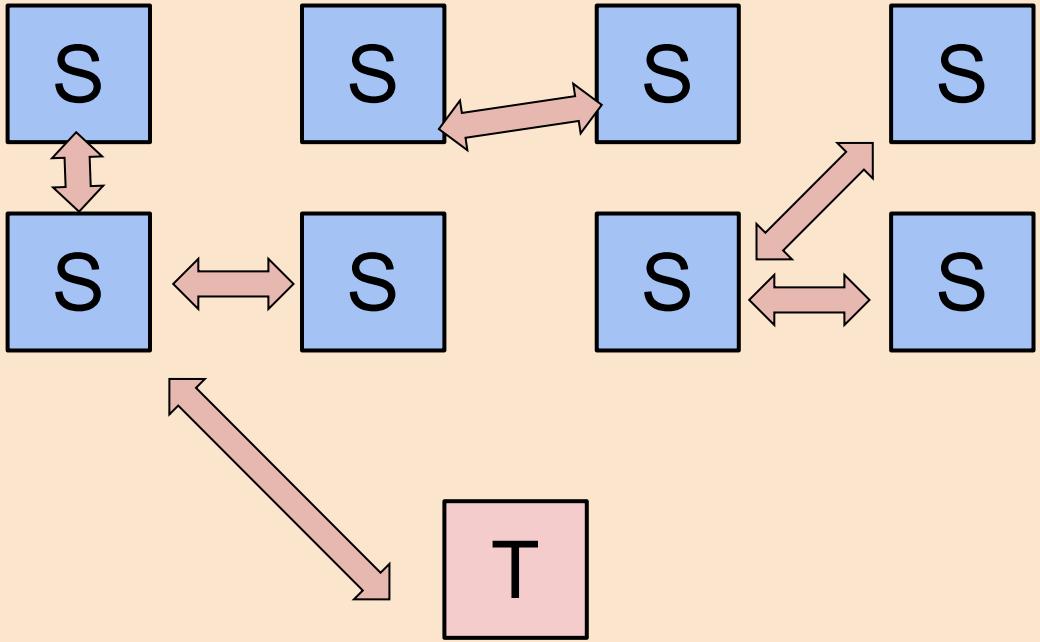
Instead,

Teaching = Facilitating experiences for developing relationships

Common Patterns in Classroom Talk



Productive Classroom Talk



nature human behaviour

LETTERS

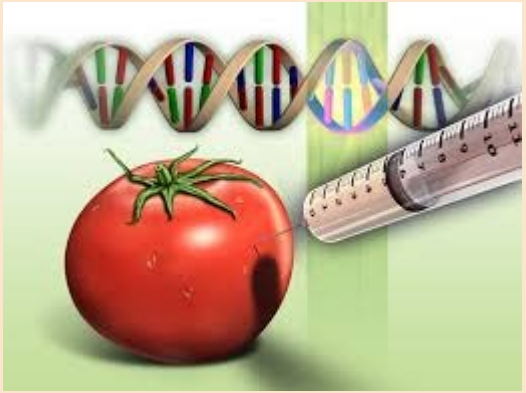
https://doi.org/10.1038/s41562-018-0520-3

Extreme opponents of genetically modified foods know the least but think they know the most

Philip M. Fernbach[1*], Nicholas Light[1], Sydney E. Scott[2], Yoel Inbar[3] and Paul Rozin[4]

Published January 14, 2019

What are Genetically Modified Organisms?



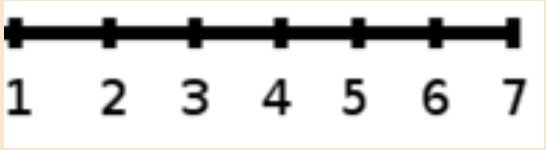
- Organisms whose **genetic** material has been artificially manipulated
- Most of our food has been genetically modified through selective breeding
- Some of our food has been genetically modified through genetic transformations of foreign DNA
- Majority of scientists agree that GMOs are safe for human consumption
- Provide many benefits to humankind
- Substantial public opposition to GM food around the world

Questions Being Asked

1. How does the extremity of opposition to GM foods relate to an individual's perceived knowledge of GM foods?
2. How does the extremity of opposition to GM foods relate to an individual's objective knowledge of science and genetics?

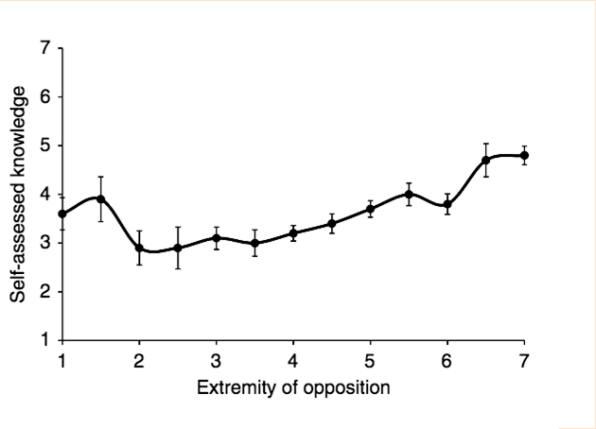
Experimental Design

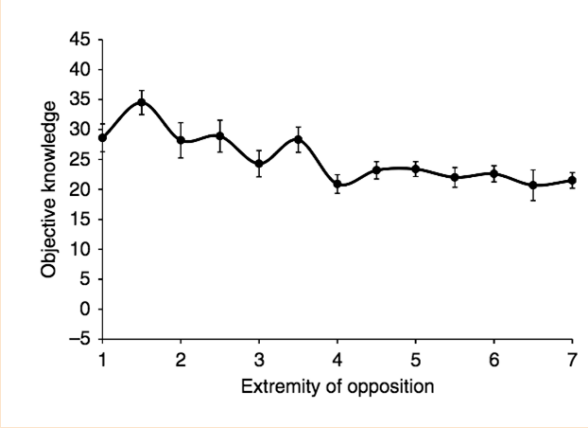
1. 501 individuals from multiple countries were asked to rank their opposition to GM Foods
2. Participants were asked to judge their understanding of GM foods (apparent knowledge)
3. Scientific and genetic knowledge was assessed using a 15 question true or false assessment
    a. The continents have been moving their location for millions of years and will continue to move.
    b. All radioactivity is man-made.



1 = No opposition
7 = Extreme opposition

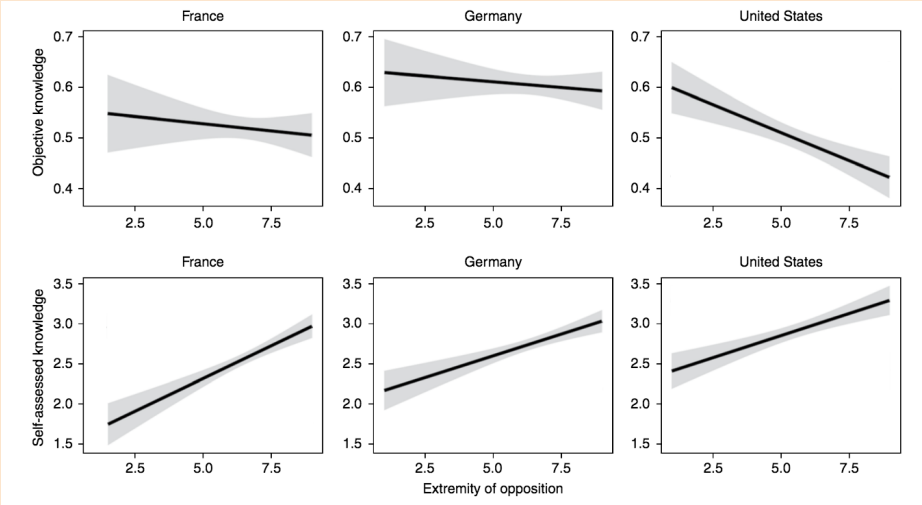
Results





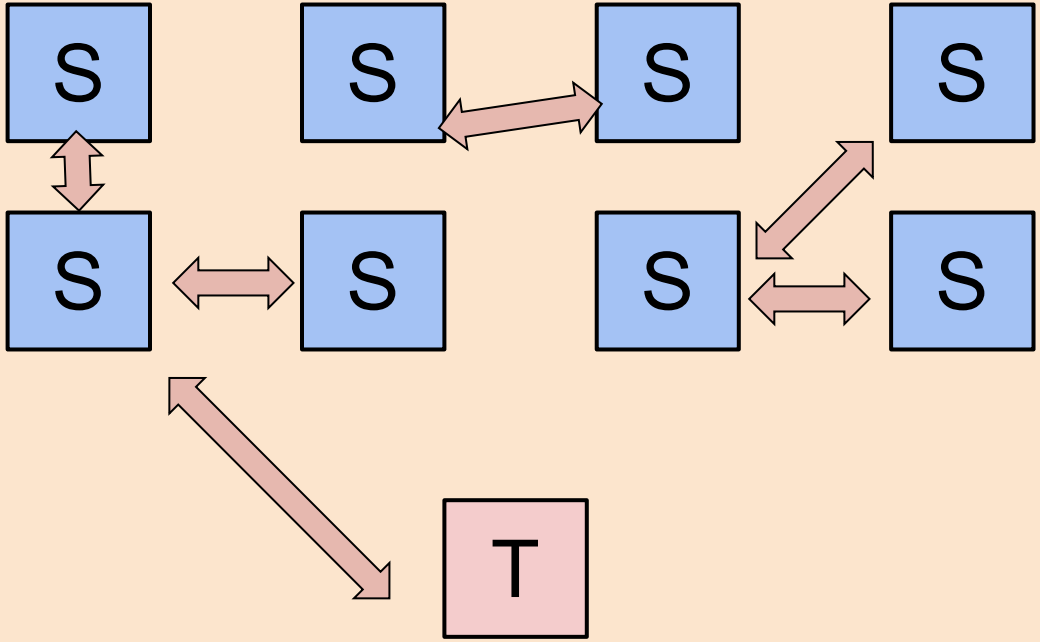
- As extremity of opposition to GM foods increases, self assessed knowledge of GM foods increases
    - Those that oppose GM foods the most, think they know the most about GM foods
- As extremity of opposition to GM foods increases, actual scientific and genetic knowledge decreases
    - Those that oppose GM foods actually know the least about science and genetics

Results



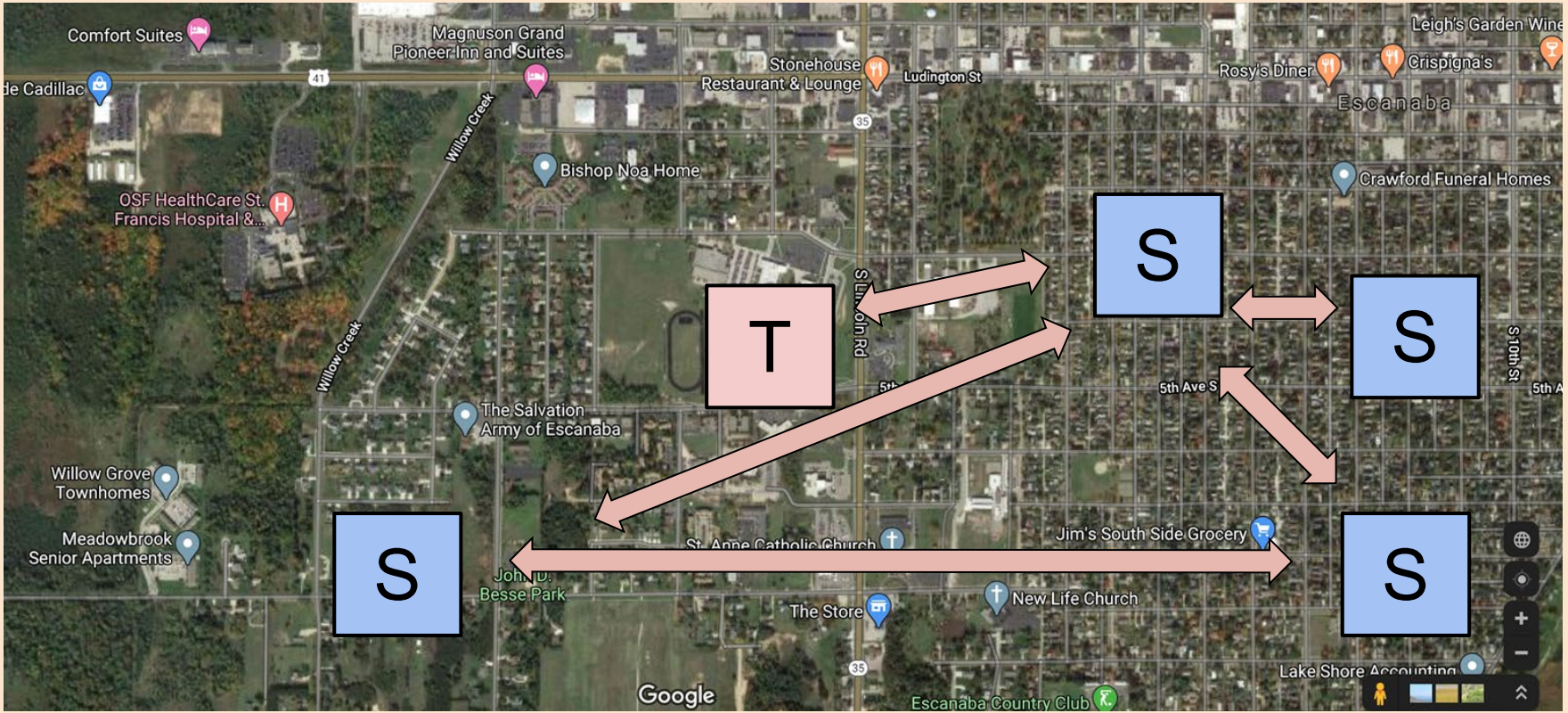
- Individuals from all countries show a correlation between the extremity of their opposition and their self-assessed knowledge
- Only the United States shows a dramatic negative correlation between extremity of opposition and actual knowledge

Productive Classroom Talk



On a scale of 1 -10 , with 1 being not comfortable and 10 being expert, how would you rate yourself in facilitating inquiry based teaching and learning in a face to face modality?

Productive Classroom Talk



On a scale of 1 -10 , with 1 being not comfortable and 10 being expert, how would you rate yourself in facilitating inquiry based teaching and learning in a distance learning modality?

Tools to help with inquiry based distance learning:

1. Keep the science authentic

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2. Use various methods to encourage student discourse

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Group	Link to Data
1	tinyurl.com/ycd2daug
2	tinyurl.com/y7onxu84
3	tinyurl.com/ya9xq6ve

Reaction #1: Use the data from slides 2 and 3 to complete the following calculations

Directions	Calculations
1. Determine the mass of zinc reacted	
2. Determine the mass of zinc chloride recovered. Which one should you use?	
3. Determine the mass of chlorine in the zinc chloride.	
4. Convert the mass of zinc and chlorine to moles of zinc and chlorine.	
5. Determine the ratio: $\frac{moles\ Cl}{moles\ Zn}$	Zn:Cl 1:2

Reaction #2: Use the data from slides 2 and 3 to complete the following calculations

Directions	Calculations
1. Determine the mass of zinc reacted	Mass of beaker + Zn = 52.20 g Mass of just beaker = 49.25 g So mass of Zn = 2.95 g
2. Determine the mass of zinc chloride recovered. Which one should you use?	Mass of ZnCl and H2O is 56.37 g. After boiling off the water the mass is 55.49 g which seems like the mass we would want to use. After removing the mass of the beaker it would be 6.24 g
3. Determine the mass of chlorine in the zinc chloride.	Mass of Cl = Mass of ZnCl - Mass of Zn = 6.24 g - 2.95 g = 3.29 g
4. Convert the mass of zinc and chlorine to moles of zinc and chlorine.	Moles of zinc: 2.95g Zn x (1 mol Zn/65.39g Zn) = 0.045 mol Zn

Reaction #3: Use the data from slides 2 and 3 to complete the following calculations

Directions	Calculations
1. Determine the mass of zinc reacted (Day 1).	
2. Determine the mass of zinc chloride recovered (Day 2). Which one should you use?	
3. Determine the mass of chlorine in the zinc chloride.	
4. Convert the mass of zinc and chlorine to moles of zinc and chlorine.	
5. Determine the ratio: $\frac{moles\ Cl}{moles\ Zn}$	Zn:Cl 1:3

Tools to help with inquiry based distance learning:

1. Keep the science authentic
2. Use various methods to encourage student discourse
3. Provide immediate formative experiences

In an experiment similar to the zinc chloride experiment, a student placed a piece of aluminum in hydrochloric acid. Hydrogen gas was given off, then the liquid was evaporated off. The recovered solid, aluminum chloride, was massed. Use the data below to determine the empirical formula of aluminum chloride.

(**show work; use units)**

mass of beaker

204.35 g

mass of aluminum and beaker before reaction	204.56 g
mass of aluminum chloride and beaker after reaction	205.39 g

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