WELCOME
MASTER CLASS SPRING 2023
SCIENCE AND RACISM DENIAL

January 25, 2023
BCI Cammilleri Hall – Gale Sinatra

February 8, 2023
University Club – Shaun Harper

February 22, 2023
University Club – Gale Sinatra, Shaun Harper, Dean Noguera

March 8, 2023
University Club – Gale Sinatra

March 22, 2023
University Club – Shaun Harper
SCIENCE DENIAL: WHY IT HAPPENS AND WHAT TO DO ABOUT IT

Oxford University Press (2021)
Enacting science understanding

Beach "border" between two counties in Florida with different stay at home policies (photo: April, 2020)
We all need to make informed decisions about scientific issues.
NOTE: We are all susceptible.

Not an “us and them” issue.
Science denial, doubt, and resistance

- **Denial** *(rare)* is a belief-based stance and a rejection of evidence.
SCIENCE DENIAL, DOUBT, AND RESISTANCE

- **Denial (rare)** is a belief-based stance and a rejection of evidence. Ex: Climate change is a hoax, the earth is flat, vaccinations cause autism
**Science denial, doubt, and resistance**

- **Denial** (rare) is a belief-based stance and a rejection of evidence. Ex: Climate change is a hoax, the earth is flat, vaccinations cause autism

- “Cafeteria denial” (more common) is choosing what to believe or deny
Doubt and resistance (most common) especially when findings don’t fit with personal beliefs, conflict with social identity, require deeper analysis, etc.
Science denial, doubt, and resistance

• Doubt and resistance (most common) especially when findings don’t fit with personal beliefs, conflict with social identity, require deeper analysis, etc.

• Doubt can be “manufactured” by vested interests (tobacco industry, petroleum industry, etc.)
Science denial, doubt, and resistance

- **Doubt and resistance (most common)** especially when findings don’t fit with personal beliefs, conflict with social identity, require deeper analysis, etc.

- **Skepticism**, is a healthy part of the scientific process
Why Trust Science? (Oreskes, 2019)

- Science relies on empirical evidence, carefully collected and analyzed

- Science builds on prior findings, accumulating evidence over time

- Science is a collective enterprise, relying on peer review, and the expert vetting of ideas, theories, results

- Science is not infallible, yet science is self-correcting

The value of a scientific attitude: an openness to seek new evidence and a willingness to change one’s mind in light of new evidence (McIntyre, 2019)
SCIENCE DENIAL, DOUBT AND RESISTANCE:

PSYCHOLOGICAL EXPLANATIONS
KEY FACTORS

1. Social Identity
2. Mental Shortcuts
3. Epistemic Cognition
4. Motivated Reasoning
5. Emotions & Attitudes
KEY FACTORS

1. Social Identity
SOCIAL IDENTITY

• Kim, Sinatra, & Seyranian (2018)
  • Group membership influences views of science
    • Individuals conform to attitudes of their group
    • In-group messages are more persuasive
  • Sense of self is tied up with social identity

For example: Identifying with a group that questions the vaccinations, or mask wearing during a pandemic
SOCIAL IDENTITY FRAMING COMMUNICATIONS ABOUT WATER CONSERVATION

• Seyranian, Sinatra, & Polikoff, (2015)
  • In-group messages are more persuasive, so change the ingroup.
  • Compared communication strategies based on knowledge deficit view to identity frames
    • Social identity framing (We Southern Californians, we conserve water.)

For high water consumers, knowledge deficit view backfired
Making sense of science claims in a digital world

- Science denial isn’t new, but is amplified through social media
- Information, misinformation, and disinformation

Netflix Film: Don’t Look Up
MAKING SENSE OF SCIENCE CLAIMS IN A DIGITAL WORLD

- How do individuals decide what knowledge to accept as valid?
  - More likely to believe science articles posted by friends on Facebook than from expert sources
  - Social media bubbles
  - Erosion of trust in expertise
MAKING SENSE OF SCIENCE CLAIMS IN A DIGITAL WORLD

- Online sources can be difficult to assess for validity, accuracy, and bias (Sinatra & Lombardi, 2020)

- Evaluating evidence and judging plausibility
Need to teach sourcing

6 STEPS to sourcing Science

(Herrick, Sinatra & Lombardi, 2023)
KEY FACTORS

1. Social Identity
2. Mental Shortcuts
Thinking and Reasoning Biases (And we all have them)

- **Reliance on System 1** (quick, intuitive) thinking versus System 2 (analytical, deliberative)

- **Confirmation Bias** – seeking, interpreting, recalling information that aligns with pre-existing beliefs

- **Availability Heuristic** – believing the information we have available to us (false balance makes misinformation available)

Senator “Snowball”
Exploring whether climate terms change trigger reactions to climate messaging

- Nationally representative sample of 6 thousand USA participants
- Climate change, climate emergency, climate crisis, climate justice
KEY FACTORS

1. Social Identity
2. Mental Shortcuts
3. Epistemic Cognition
Epistemic cognition Influences science understanding (Sinatra & Hofer, 2016)

• Epistemic cognition – how individuals think and reason about knowledge and knowing (Hofer, 2016)

  • What is knowledge? How do we know what we know?
  • What are our sources of knowledge and why?
  • Influences science understanding (Sinatra & Hofer, 2016)

Critical when individuals must:

- Decide what counts as evidence
- Resolve competing knowledge claims
- Evaluate information critically
- Integrate multiple sources of information
- Incorporate new knowledge
Lombard et al. (2013; 2022) Model-Evidence Link (MEL) Diagram

Directions: draw two arrows from each evidence box. One to each model. You will draw a total of 8 arrows.

Evidence #1

Evidence #2

Model A

Model B

Evidence #3

Evidence #4

supports model

strongly supports model

contradicts model

nothing to do with model
EPISTEMIC TRUST

• What sources of knowledge do individuals trust?

• Decline in trust of authorities and experts.

• Social identity influence trust (Dr. Fauci hero or villain?).

• Reasons for distrust – especially among communities historically and currently mistreated by science/scientists.
KEY FACTORS

1. Social Identity
2. Mental Shortcuts
3. Epistemic Cognition
4. Motivated Reasoning
Motivated reasoning

- Motivations can bias understanding - deciding what evidence to accept based on the conclusion one prefers

- E.g., individuals are more critical of the methods of a research study if they don’t like the outcomes

- Identity can motivate our reasoning
MOTIVATIONS THAT INFLUENCE REASONING
(SINATRA, KIENHUES, & HOFER, 2014)
I’m a Conservative and Conservatives Reject Climate Change
MOTIVATIONS THAT INFLUENCE REASONING (SINATRA, KIENHUES, & HOFER, 2014)

Countries with higher GDP have lower Climate Change Acceptance
MOTIVATIONS THAT INFLUENCE REASONING (SINATRA, KIENHUES, & HOFER, 2014)

“Snowmageddon” reflects Availability Heuristic

Social Identity

Cognitive Biases

Vested Interest

Epistemic Motives
MOTIVATIONS THAT INFLUENCE REASONING (SINATRA, KIENHUES, & HOFER, 2014)

- Social Identity
- Cognitive Biases
- Vested Interest
- Epistemic Motives

Need for Closure - Discomfort with Ambiguity of Climate Models
KEY FACTORS

1. Social Identity
2. Mental Shortcuts
3. Epistemic Cognition
4. Motivated Reasoning
5. Attitudes & Emotions
RELATIONSHIP BETWEEN ATTITUDES AND CONCEPTUAL KNOWLEDGE (Sinatra & Seyranian, 2016)

Conceptual Knowledge

- Accurate Conception
- Misconception

Attitudes

- Pro
- Con

Profiles:
- Profile A
- Profile B
- Profile C
- Profile D
<table>
<thead>
<tr>
<th>Conceptual Knowledge</th>
<th>Attitudes</th>
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<tr>
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Think humans cause climate change/In favor of climate change initiatives
RELATIONSHIP BETWEEN ATTITUDES AND CONCEPTUAL KNOWLEDGE

Think humans cause climate change/Against climate change initiatives

Conceptual Knowledge

Accurate Conception
Profile A
Profile B

Misconception
Profile C
Profile D
RELATIONSHIP BETWEEN ATTITUDES AND CONCEPTUAL KNOWLEDGE

Think pollution causes climate change/In favor of climate change initiatives

Conceptual Knowledge

Accurate Conception

Misconception

Profile A

Profile C

Profile B

Profile D

Attitudes

Pro

Con
RELATIONSHIP BETWEEN ATTITUDES AND CONCEPTUAL KNOWLEDGE

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Think climate change is not human caused/Against climate change initiatives
Science interest and emotions

Hot Wheels® Speedometry™ encourages inquiry and real-world, problem-based learning through play, hands-on activities and in-depth lesson plans that is mapped to state and national standards including Common Core State Standards (CCSS), Next Generation Science Standards (NGSS) and Texas Essential Knowledge and Skills (TEKS). This education curriculum, co-created with researchers at the University of Southern California Rossier School of Education, combines Hot Wheels® fun, imagination, and action, as well as toys and track to accelerate learning. Read More
TAR AR: BRINGING THE PAST TO LIFE IN PLACE-BASED AUGMENTED REALITY SCIENCE LEARNING

1. Does AR technology facilitate learning of science content?
2. Does AR technology facilitate interest/emotions in science distinguishable from interest/emotions in AR?
3. What surprised participants?
4. Did knowledge shift?

Gale testing out AR at La Brea During Data Collection
• Participants see a (virtual) bubbling pit of asphalt underneath the plywood platform.

• Participants “discover” fossils in the tar and send them to a lab to be identified.

• Fossils help them to understand the ice environment of LA.
FIELD EXPERIENCE

- Participants see an entrapment scene
- Life size mammoths, saber-tooth cats, dire wolves walk right past them
- Helps them learn how plants/animals get stuck in the tar

Participants demo our AR experience
A little less conversation, a little more action please

- Conclude the Sinatra & Hofer (2021) volume with action steps for:
  - Individuals
  - Educators
  - Policy Makers
  - Science Communicators
What can individuals do?

- **Cultivate a scientific attitude** and nurture science appreciation in others.
- **Improve search skills** and evaluation of scientific claims and sources.
- **Be aware of cognitive biases** and motivations in your own reasoning.
- **Learn to listen** to others with curiosity, compassion, and openness.
- **Vote** for those who value, support, and fund science and who base policy decisions on evidence.
WHAT CAN EDUCATORS DO?

• Enhance your own science understanding.
• Teach about the nature of science.
• Foster scientific thinking in all students.
• Teach real world applications of science.
• Let students choose areas of inquiry.
• Be aware of strong prior beliefs, attitudes, and identity.
• Recognize students’ emotions.
• Foster digital science literacy.
What Can Science Communicators Do?

- Write about science for the general public.
- Write about how scientists know as much as what they know.
- Know your audiences’ likely misconceptions, motivations, attitudes, emotions, and identities.
- Provide the evidence for scientific claims.
- “Both sides” is for opinions not science.
What Can Policy Makers Do?

- Hire and listen to science advisors and empirical evidence and use this as a basis for policy.
- Support educational standards that emphasize how to think, over what to think.
- Push back on the current trend of ignoring factual basis of claims.
- Demand more rigorous teacher preparation standards.
- Press social media toward responsibility, transparency, accountability.
THANK YOU!

**CLASS 2** **WEDNESDAY, FEBRUARY 8**

**LOCATION: UNIVERSITY CLUB**