



— SPRING 2023 SERIES —

MASTER CLASS

USC ROSSIER SCHOOL OF EDUCATION

Master Class Series on Science Denial and Racism Denial

WELCOME



Shaun R. Harper
University Professor, Provost Professor of
Education and Business, Clifford and
Betty Allen Chair in Urban Leadership,
USC Race and Equity Center Founder
and Executive Director



Gale M. Sinatra
Stephen H. Crocker Professor of
Education, Associate Dean for Research

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

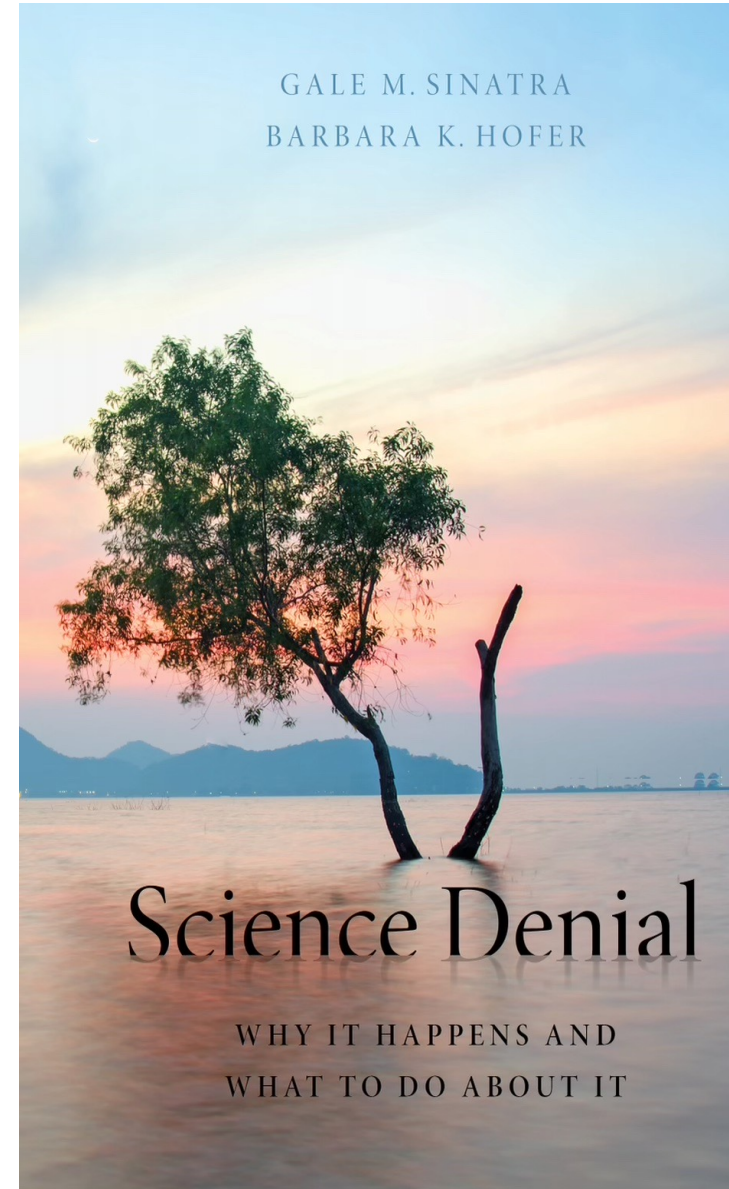
March 22, 2023

University Club – Shaun Harper



*SCIENCE DENIAL: WHY IT
HAPPENS AND WHAT TO DO
ABOUT IT*

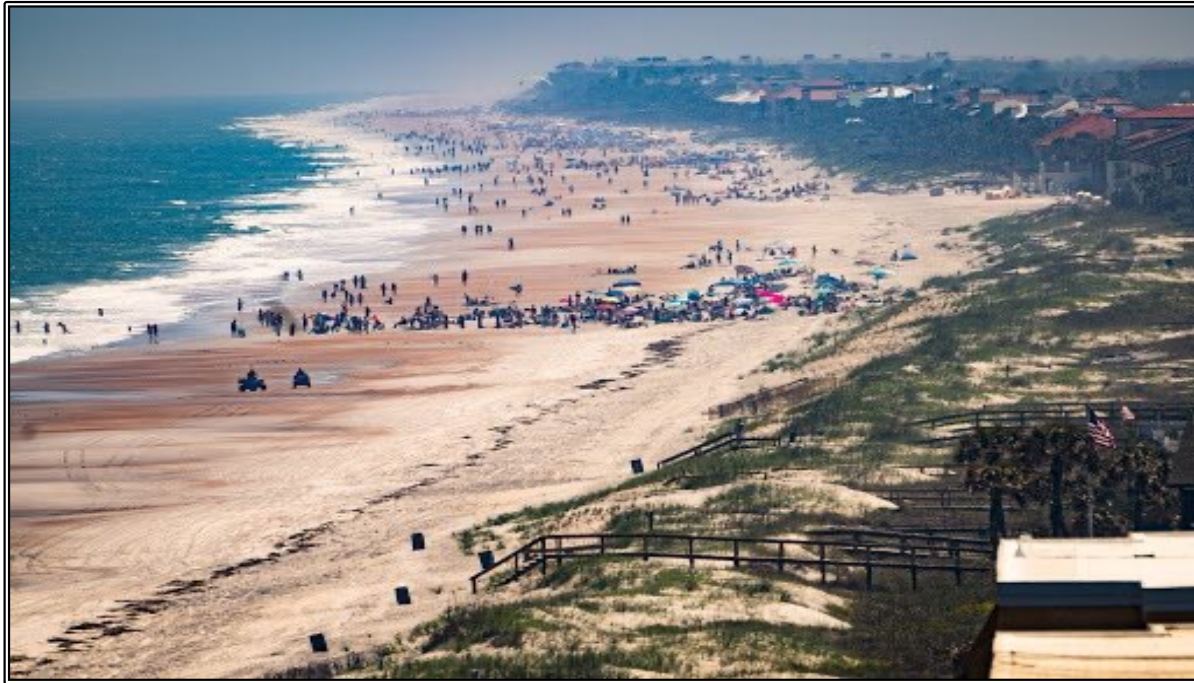
OXFORD UNIVERSITY PRESS (2021)



USC University of
Southern California



ENACTING SCIENCE UNDERSTANDING



Beach "border" between two counties in Florida
with different stay at home policies
(photo: April, 2020)



A pair of hands, rendered in a metallic or greyish tone, gently cradles a small, detailed globe of the Earth. The globe shows continents, oceans, and swirling white clouds. The background is a dark, starry space with faint, glowing patterns. The text is overlaid on the globe and hands.

**We all need to make informed
decisions about scientific issues.**

SCIENCE DENIAL, DOUBT, AND RESISTANCE

SCIENCE DENIAL

DOUBT

RESISTANCE



NOTE: **We are all susceptible.**

Not an “*us and them*” issue.



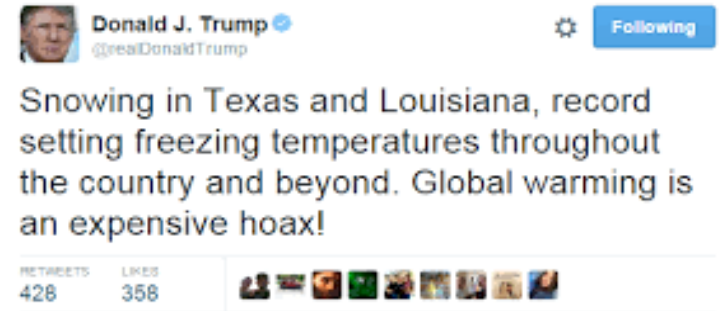
SCIENCE DENIAL, DOUBT, AND RESISTANCE

- **Denial (rare)** is a belief-based stance and a rejection of evidence.



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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



SCIENCE DENIAL, DOUBT, AND RESISTANCE

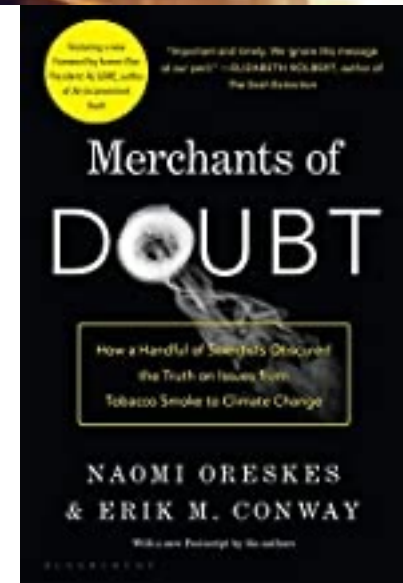
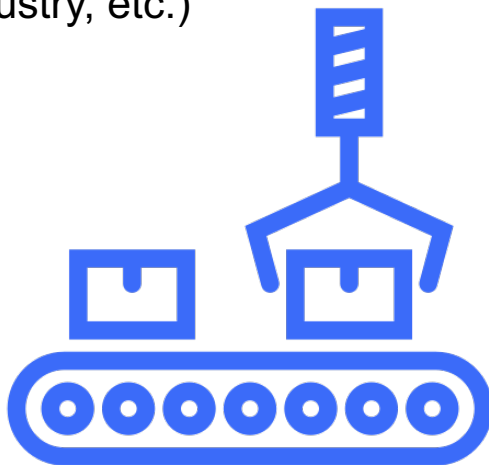


- **Doubt and resistance (most common)** especially when findings don't fit with personal beliefs, conflict with social identity, require deeper analysis, etc.



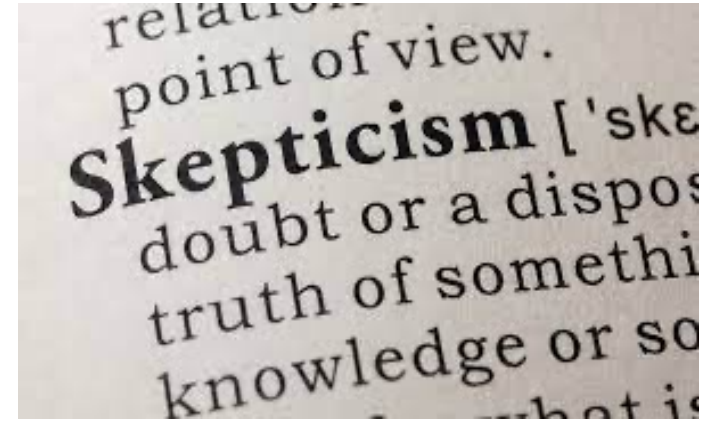
SCIENCE DENIAL, DOUBT, AND RESISTANCE

- **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? (ORESQUES, 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:

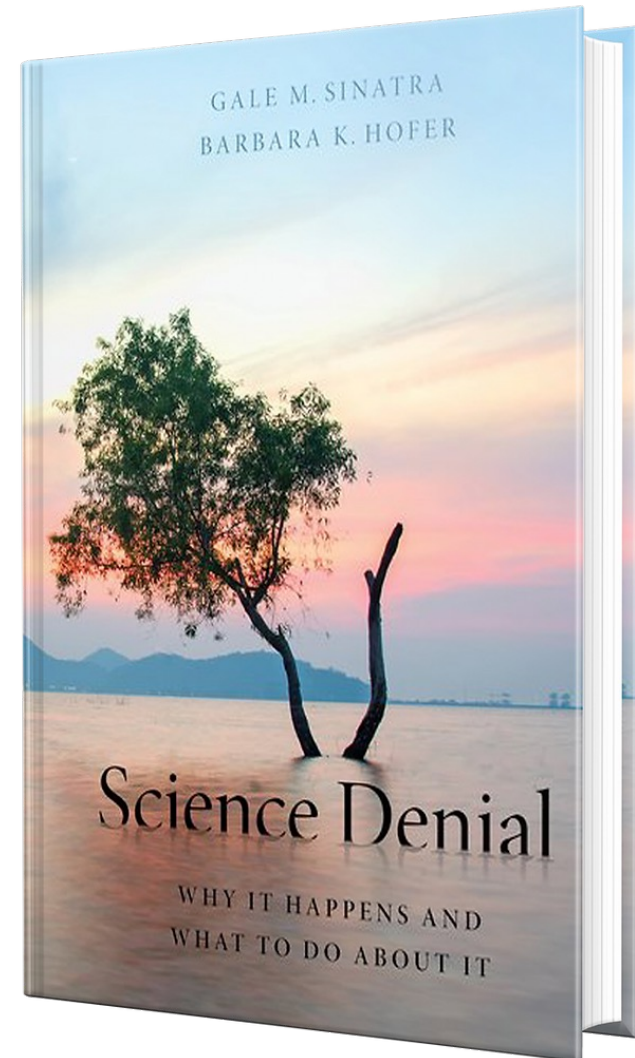
PSYCHOLOGICAL EXPLANATIONS





KEY FACTORS

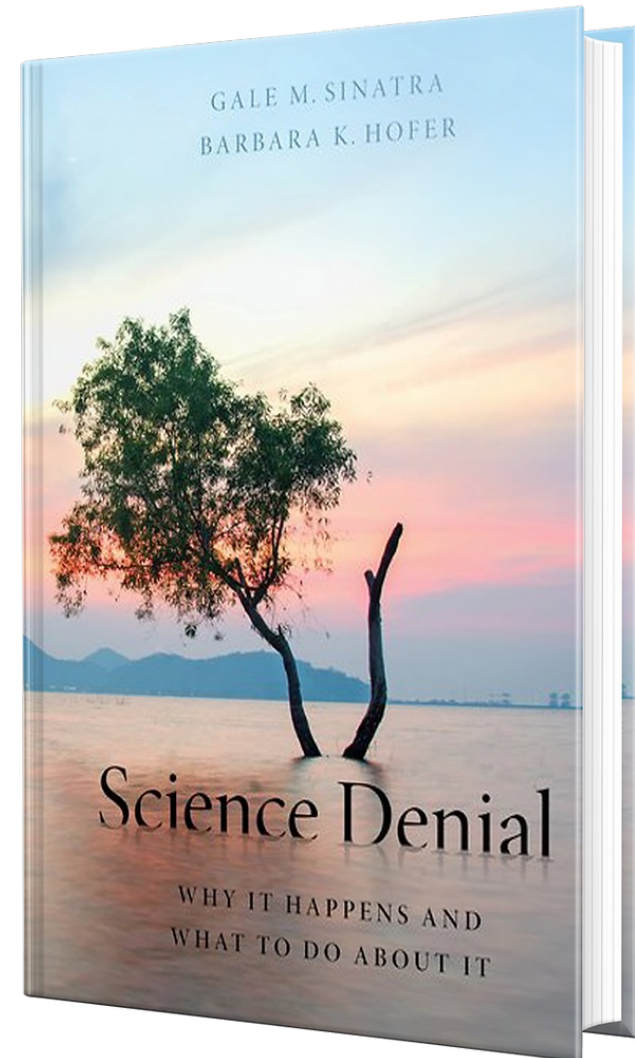
1. Social Identity
2. Mental Shortcuts
3. Epistemic Cognition
4. Motivated Reasoning
5. Emotions & Attitudes





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



Netflix Film: Don't Look Up

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



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

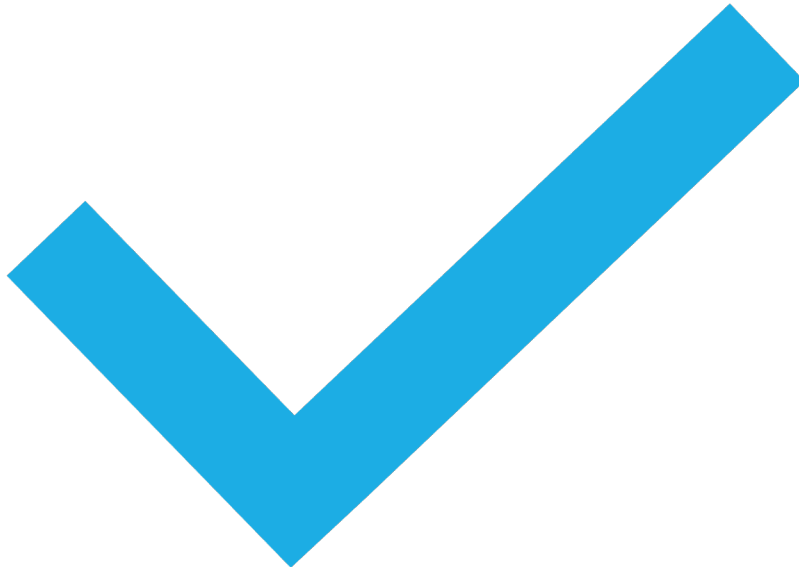




NEED TO TEACH SOURCING

6 STEPS TO SOURCING SCIENCE

(HERRICK, SINATRA &
LOMBARDI, 2023)



IS IT CREDIBLE? IS IT PLAUSIBLE?

HOW TO SCIENTIFICALLY EVALUATE ONLINE EVIDENCE AND CLAIMS

STOP. STEP BACK. READ.



Go past the headline or post claim. Think about the **claims** the person is making and what **explanation** is being used to support those claims.

BECOME YOUR OWN FACT-CHECKER.
EVALUATE SOURCES TO DETERMINE IF THEY ARE CREDIBLE.

Ask yourself, Is this explanation **plausible**, and how do I know?

- Who is the author?
- What is the purpose?
- Where was it posted?
- Where is the science from?



MAKE A JUDGMENT.
IS THE CLAIM PLAUSIBLE?

NO? Don't share because it doesn't seem reliable
YES! Continue to the evaluation stage



**EVALUATE EVIDENCE AND
CONNECTION TO THE CLAIM**

Consider strength of evidence in connection to a claim, but also consider how well the evidence connects to an **alternative** claim.

- What is the **quantity** and **quality** of evidence?
- Does evidence **support** the claim?
- Does it support an **alternative** claim?



REAPPRAISE.
**IS THE CLAIM PLAUSIBLE?
IN LIGHT OF A COMPETING CLAIM?**



MAKE A TENTATIVE JUDGMENT.

Now that you have engaged in purposeful source and claim evaluation, you can come to a tentative judgment about the validity of the scientific information.

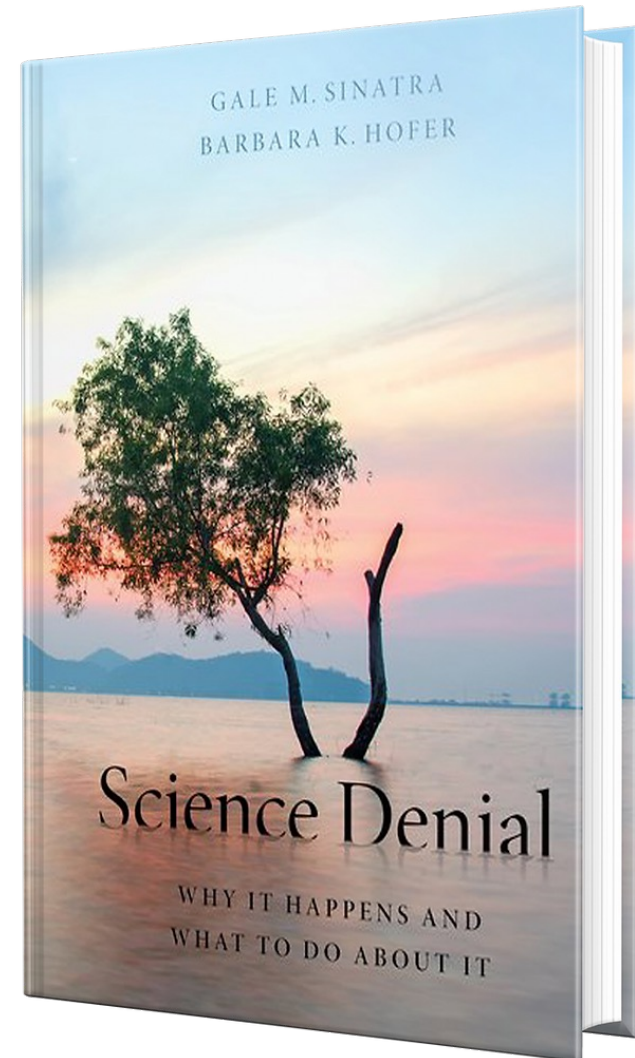


**ONLY SHARE SCIENTIFIC INFORMATION ONLINE
THAT YOU HAVE VERIFIED.**



KEY FACTORS

1. Social Identity
2. Mental Shortcuts



THINKING AND REASONING BIASES (AND WE ALL HAVE THEM)



Senator “Snowball”

- **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)

SINATRA ET AL. (2022) WORDS MATTER: PUBLIC PERCEPTIONS OF CLIMATE CHANGE TERMINOLOGY



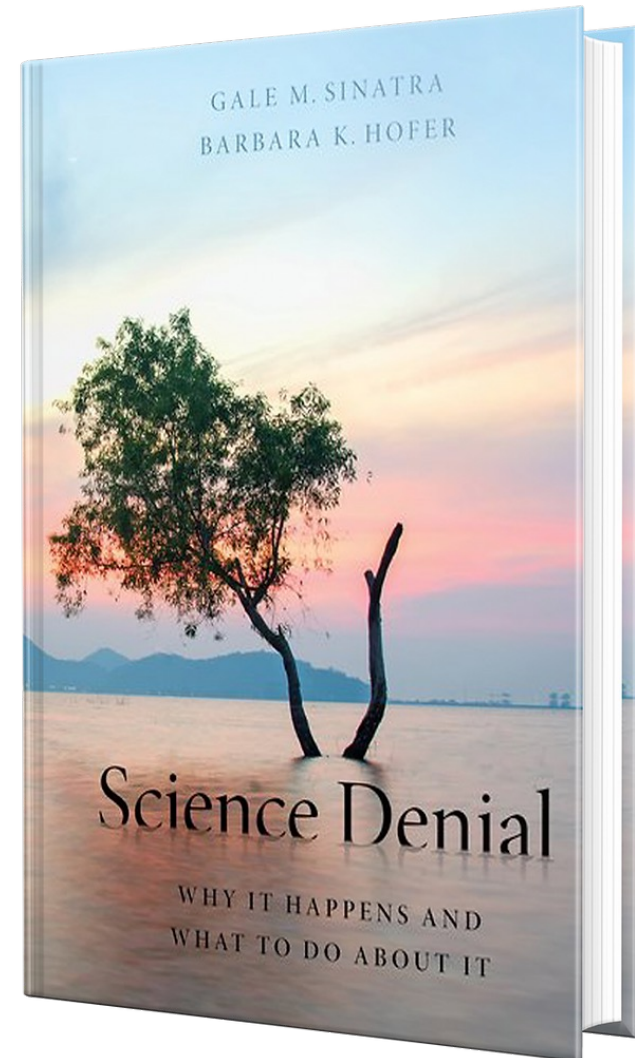
- Exploring whether **climate terms** change trigger reactions to climate messaging
 - Nationally representative sample of 6 thousand USA participants
 - Climate change, climate emergency, climate crisis, climate justice





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

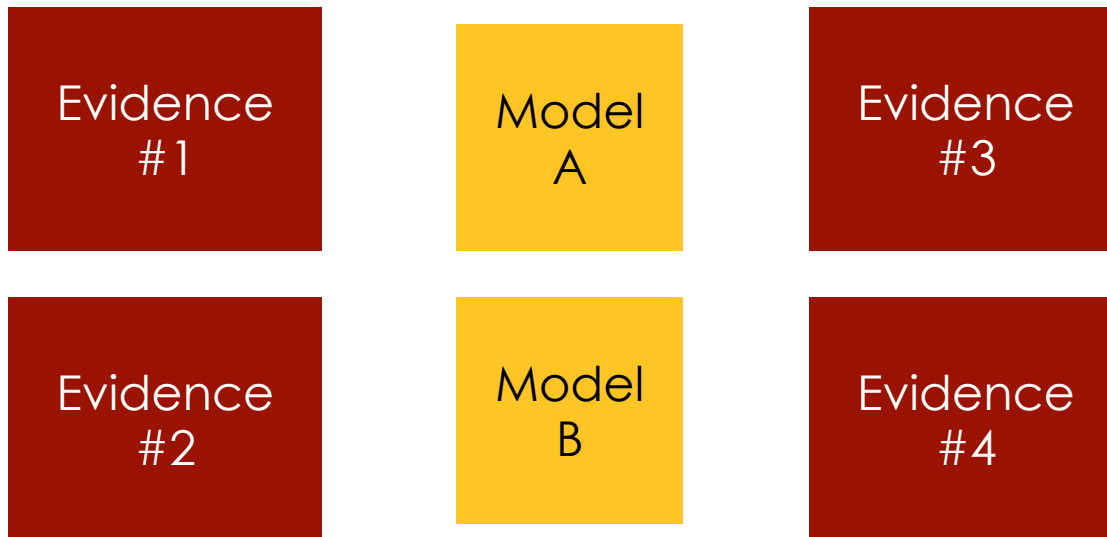
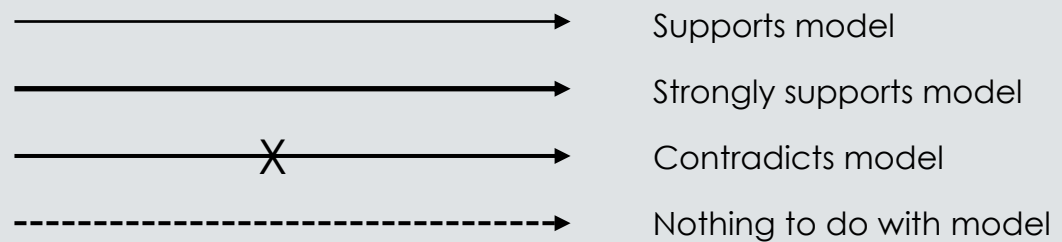
Evaluate
information
critically

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.



EPISTEMIC TRUST

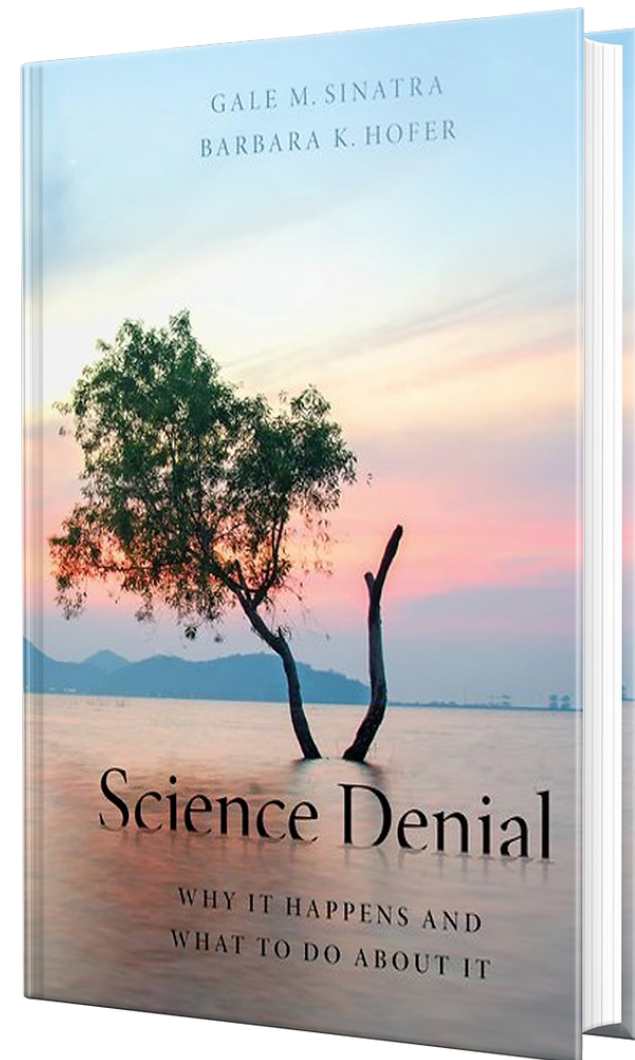
- What sources of knowledge do individuals trust?
- Decline in trust of authorities and experts.
- Social identity influence trust (Dr. Fauci hero or villain?).
- Reasons for distrust – especially among communities historically and currently mistreated by science/scientists.





KEY FACTORS

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



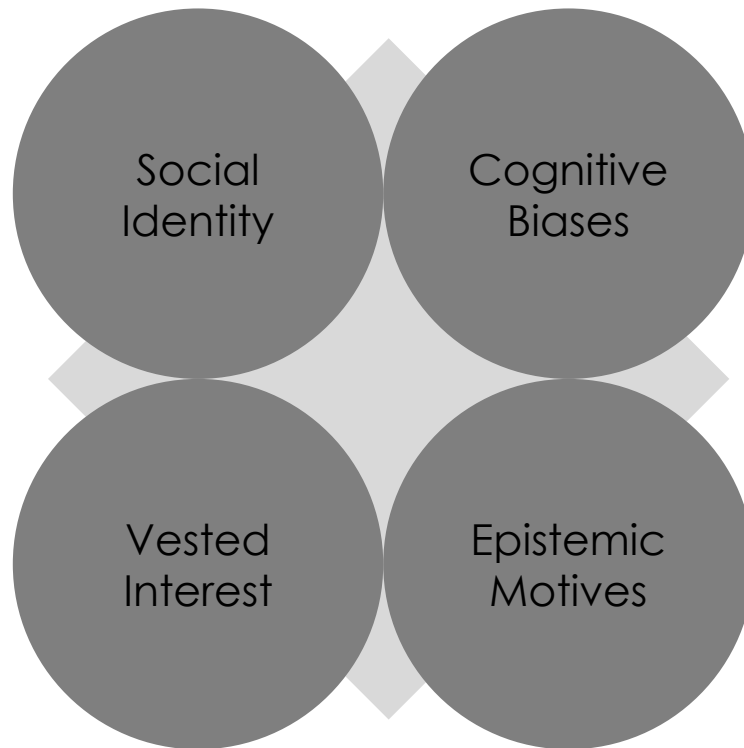
MOTIVATED REASONING

- 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

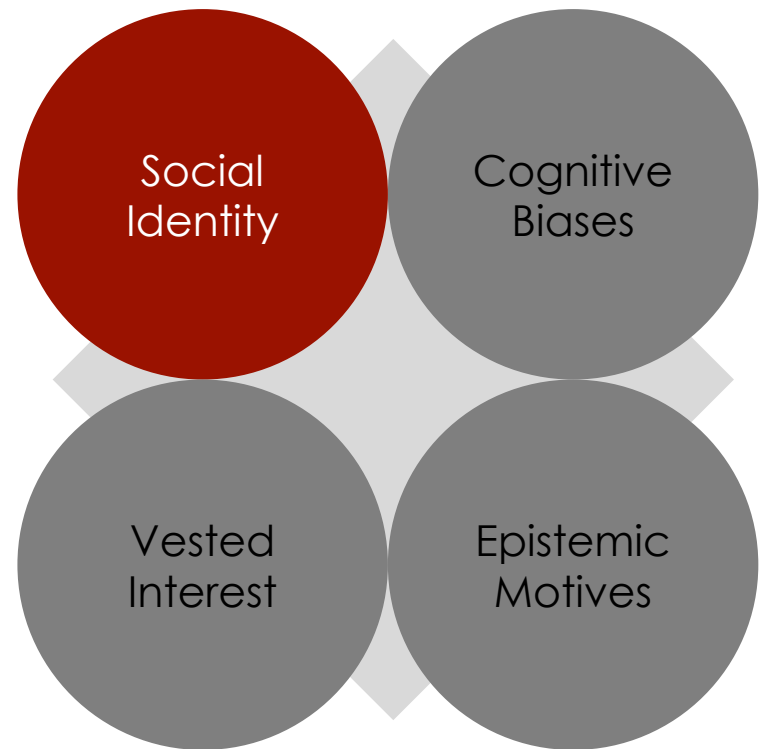
(SINATRA, KIENHUES, & HOFER, 2014)



MOTIVATIONS THAT INFLUENCE REASONING

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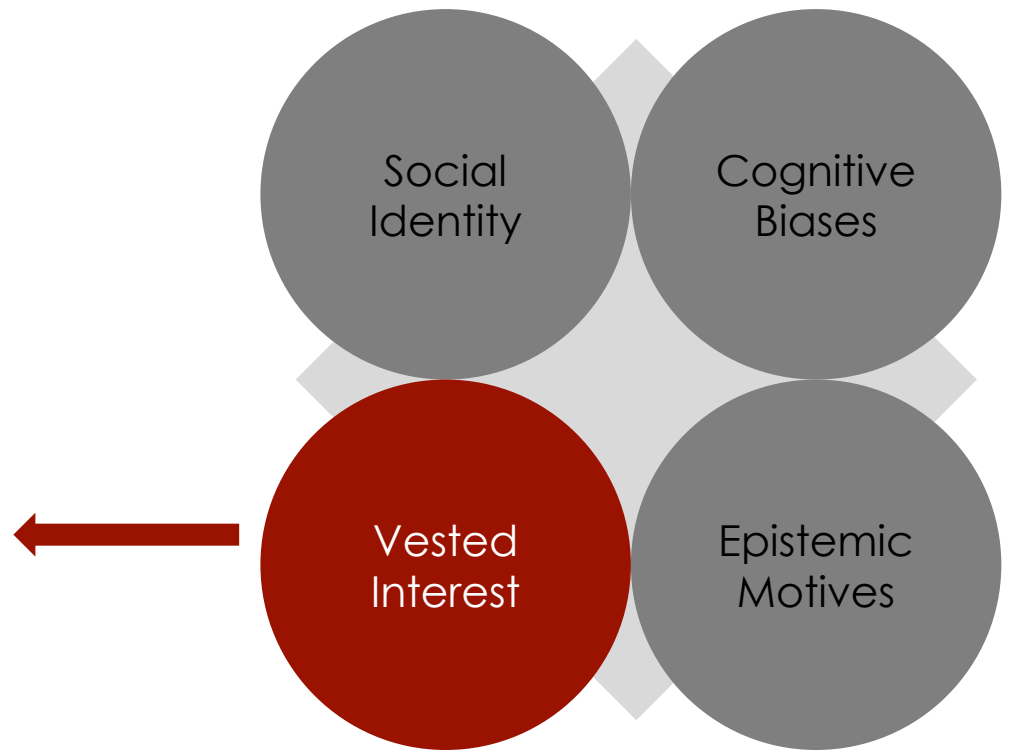
I'm a Conservative
and Conservatives
Reject Climate
Change



MOTIVATIONS THAT INFLUENCE REASONING

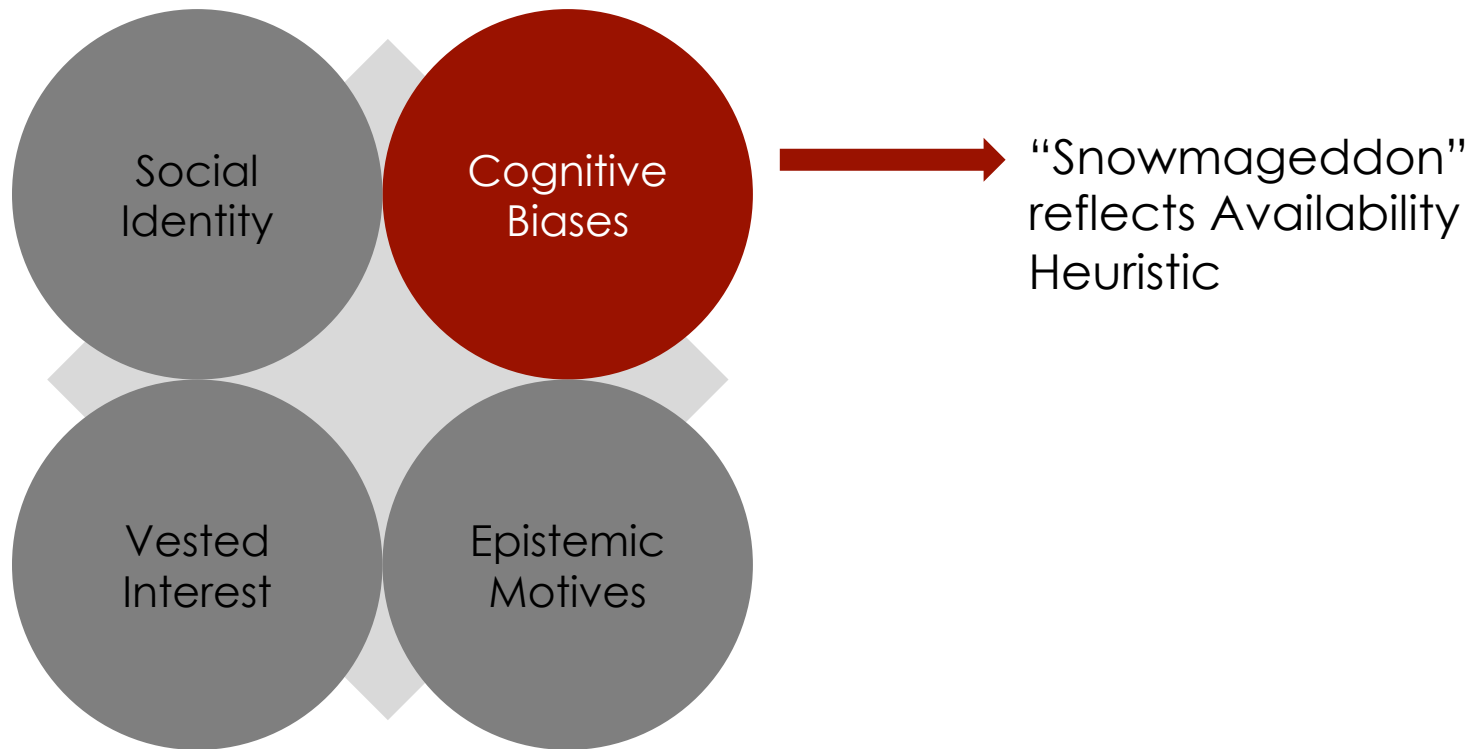
(SINATRA, KIENHUES, & HOFER, 2014)

Countries with higher GDP have lower Climate Change Acceptance



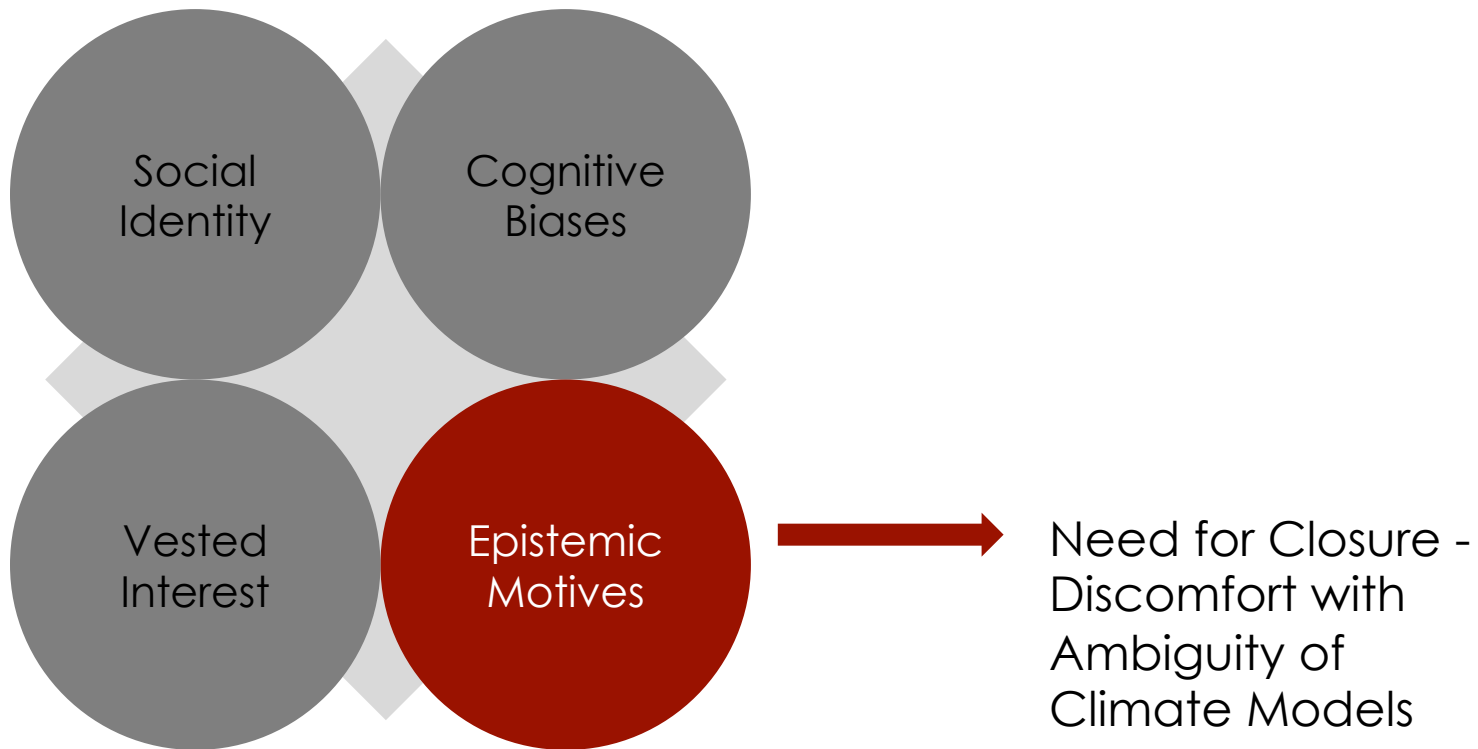
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MOTIVATIONS THAT INFLUENCE REASONING

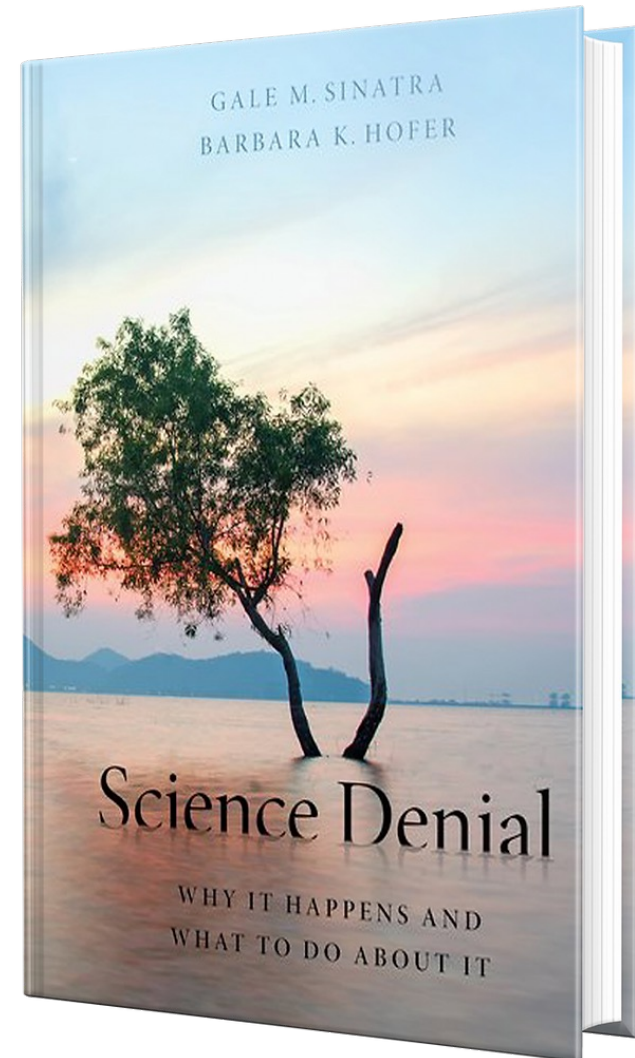
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KEY FACTORS

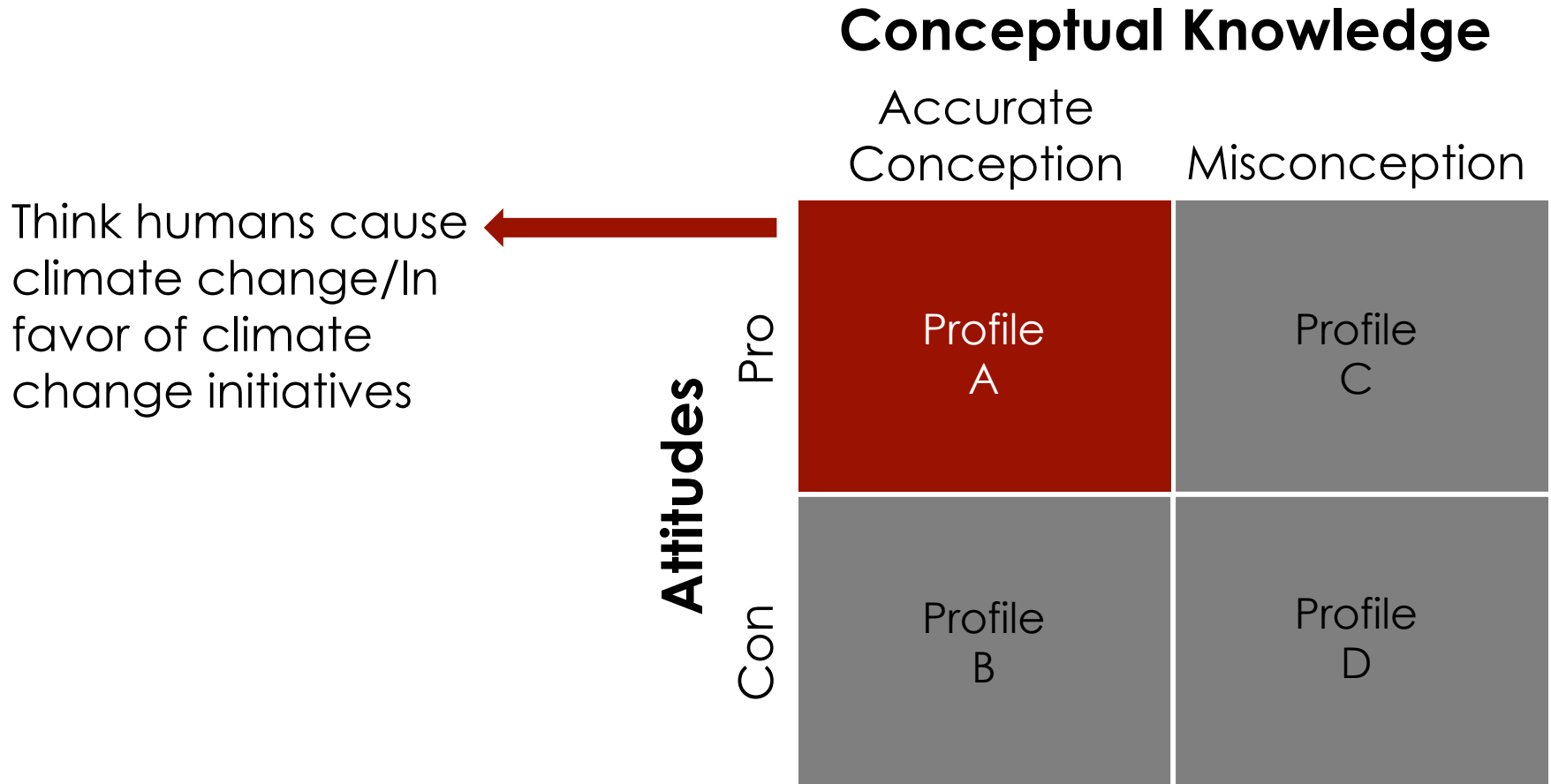
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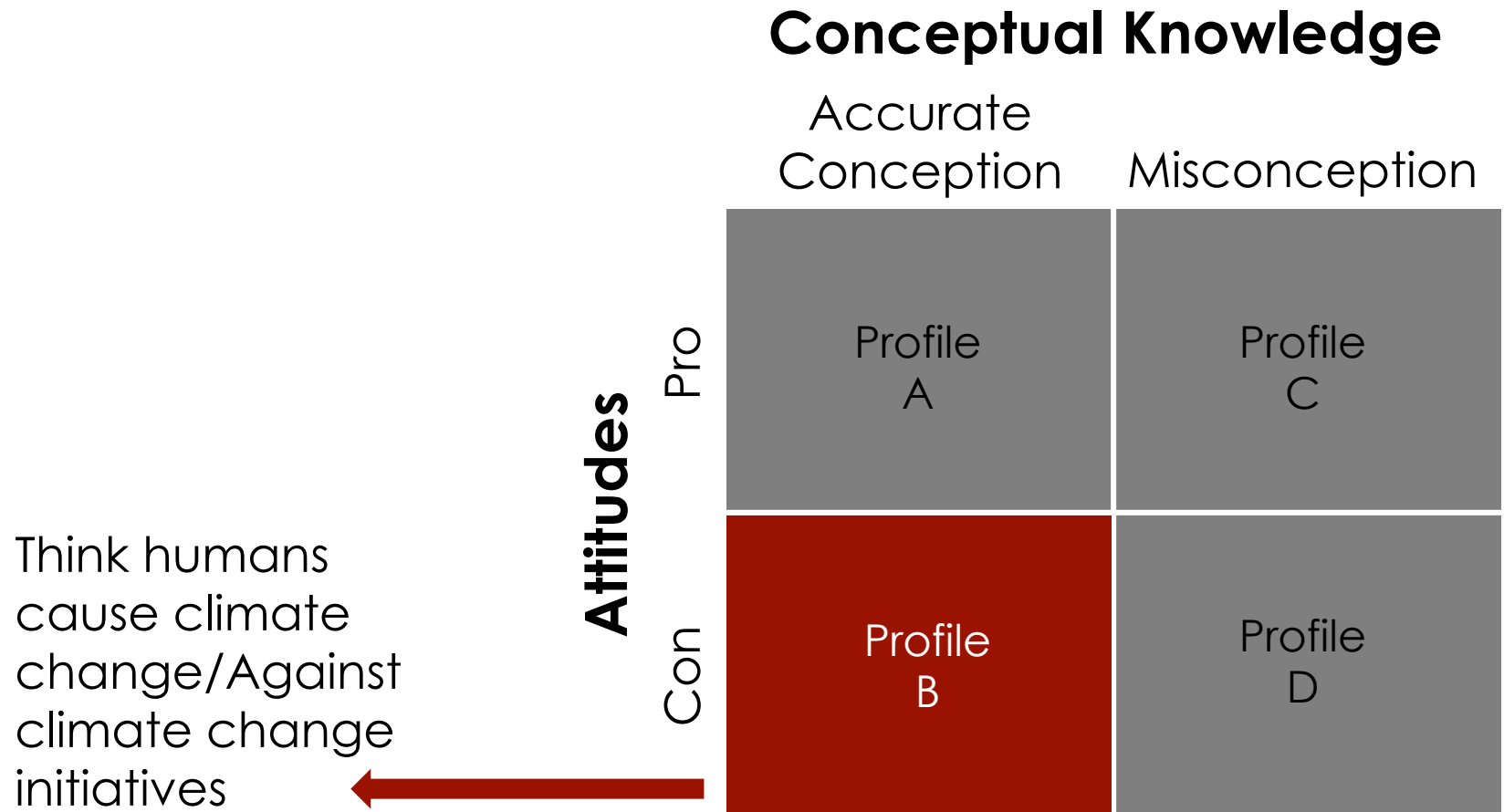
RELATIONSHIP BETWEEN ATTITUDES AND CONCEPTUAL KNOWLEDGE (SINATRA & SEYRANIAN, 2016)

		Conceptual Knowledge	
		Accurate Conception	Misconception
Attitudes	Pro	Profile A	Profile C
	Con	Profile B	Profile D

RELATIONSHIP BETWEEN ATTITUDES AND CONCEPTUAL KNOWLEDGE



RELATIONSHIP BETWEEN ATTITUDES AND CONCEPTUAL KNOWLEDGE



RELATIONSHIP BETWEEN ATTITUDES AND CONCEPTUAL KNOWLEDGE

Conceptual Knowledge

Accurate
Conception Misconception

Attitudes	Pro	Profile A	Profile C
	Con	Profile B	Profile D

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

RELATIONSHIP BETWEEN ATTITUDES AND CONCEPTUAL KNOWLEDGE

Conceptual Knowledge

Accurate
Conception Misconception

Attitudes	Pro	Profile A	Profile C
	Con	Profile B	Profile D

→ Think climate change is not human caused/Against climate change initiatives

SCIENCE INTEREST AND EMOTIONS



The advertisement features the Hot Wheels logo at the top, followed by the text "SPEEDOMETRY" in a stylized font. Below this, it reads "MATH AND SCIENCE CURRICULUM" and "STEM Lesson Plans & Activities". The background is a chalkboard with scientific terms like "PE = Potential Energy" and "KE = Kinetic Energy" written on it. In the foreground, there are Hot Wheels tracks, a stack of books, and a magnifying glass. A video player shows a young girl playing with Hot Wheels tracks. At the bottom, there are three buttons: "GRADE 4 LESSONS", "CLASSROOM KIT", and "FOR FAMILIES".

Hot Wheels® Speedometry™

GRADE 4 LESSONS **CLASSROOM KIT** **FOR FAMILIES**

Accelerate STEM Learning Through Play!

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](#)



USC University of
Southern California



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



PIT 91 EXPERIENCE



- 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 demo our AR 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





A LITTLE LESS CONVERSATION, A LITTLE MORE ACTION PLEASE

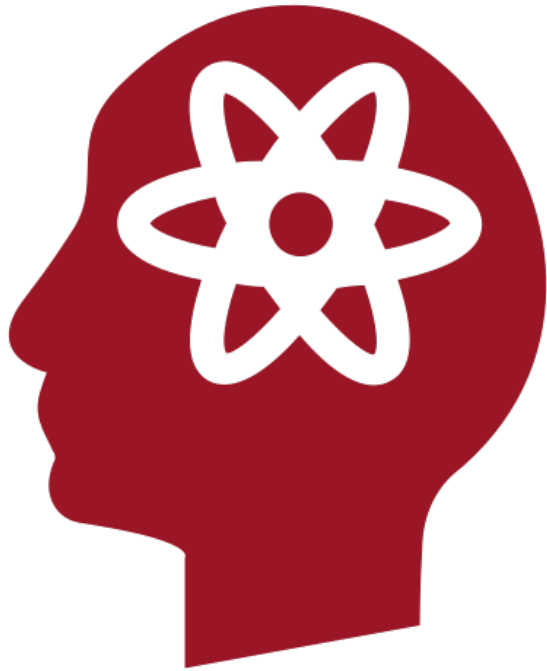


- Conclude the Sinatra & Hofer (2021) volume with action steps for:
- Individuals
- Educators
- Policy Makers
- Science Communicators





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.

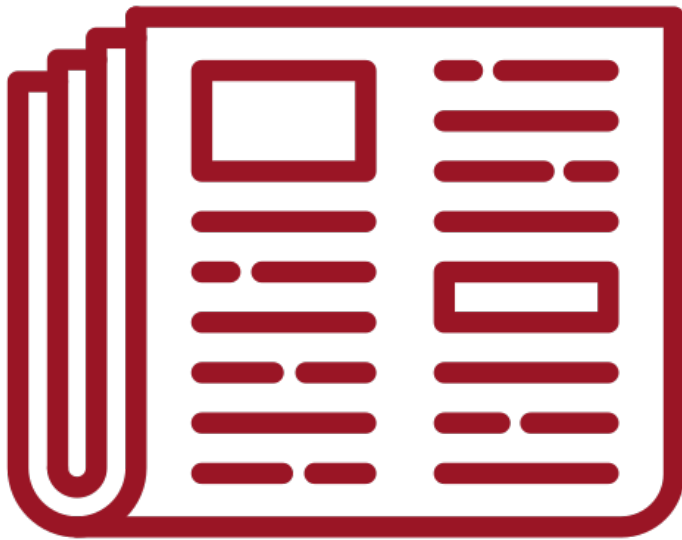


WHAT CAN EDUCATORS DO?

- 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

— SPRING 2023 SERIES —

MASTER CLASS

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*Master Class Series on
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