

Framework for Thinking Critically About Science in the Media

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NACTA
June 2018

Overview

1. Background
2. Framework on Critical Thinking
3. Pilot Session: Applying the Framework to the film What the Health
4. Pilot Session: Feedback

Background

Why are there failures in critical thinking about science in the media?

1. Cultural factors (trends, technology, etc.)
2. Cognitive biases

Cultural factors (example)

For example:

Speed of communication: Information from media outlets spreads quickly, sometime with little verification, advantaging misinformation.

Impact on critical thinking:

People digest an eye-catching headline and have little interest in the reliability of the claim.



Note: It's not a rat, just a regular chicken nugget with extra batter

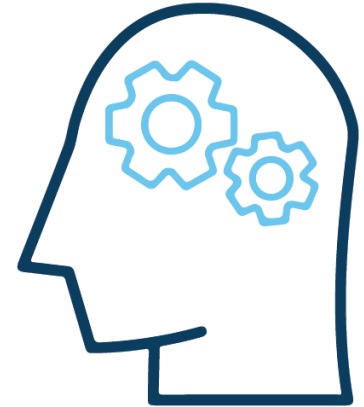
Cultural factors

- Social media is a major source of information and misinformation
- False information can be transmitted more quickly than true information
- Many prominent influencer groups promote false ideas about science / agriculture
- Distrust of science and technology are high
- Fewer than 2% of Americans farm, but many hold strong views on farm practices



Cognitive biases

- Heuristics and biases research helps explain why these false beliefs are held:
 - Confirmation bias
 - Affect heuristic
 - Overconfidence
 - Knowledge illusion
 - Confusing correlation for causation
 - Relying on anecdotal evidence



Framework on Critical Thinking

Critical thinking is a set of skills and habits

COGNITIVE BIASES

1. Check the facts



Confirmation bias

Diligent Clarification:

Check that claims of fact are true, unambiguous, and comprehensive.

2. Analyze them objectively



Affect heuristic

Slow Thinking:

Make appropriate inferences based on logic, probability, and evidence.

3. Form a judgment



Overconfidence

Humble Self-Reflection:

Be clear about what is known and what is not known.

Pilot Session: Applying the Framework to the film What the Health

Thanks to our classroom collaborators:

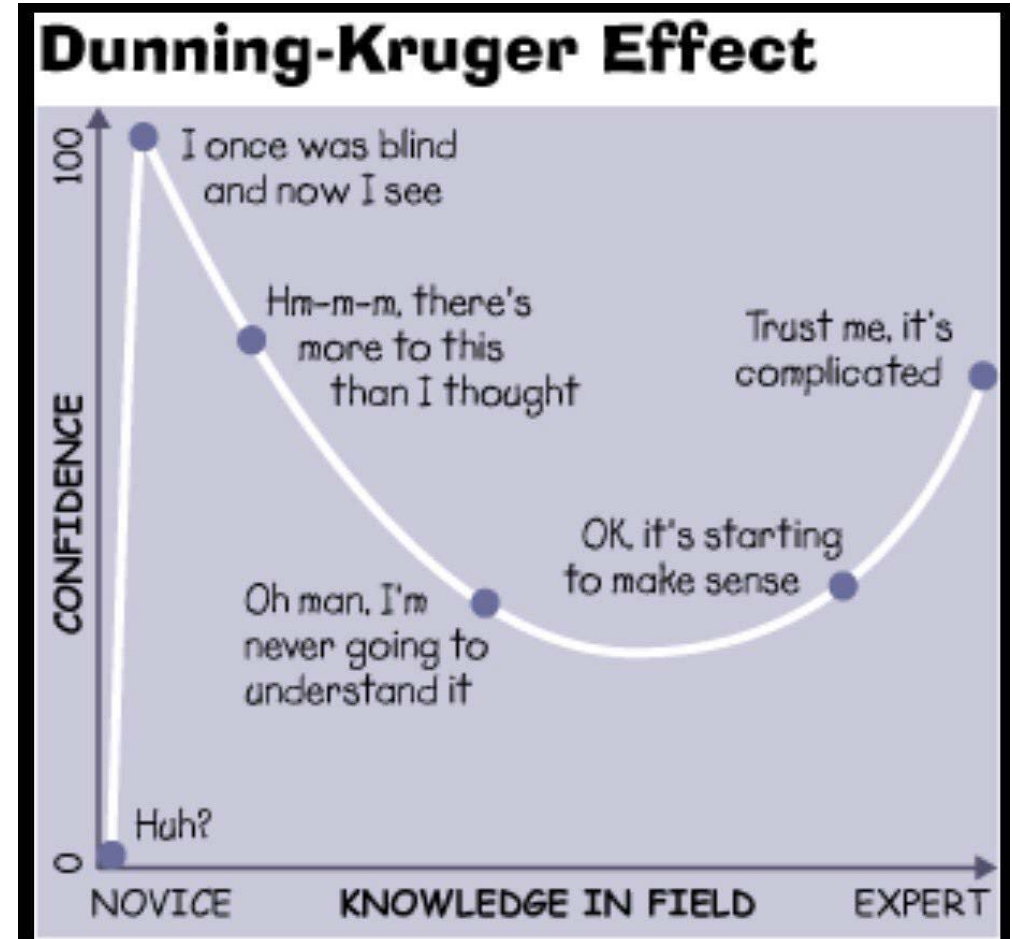
1. **Cameron Dale** and her science/agriculture students at Elgin High School (Elgin, Oklahoma)
2. **JoAnn Pfeiffer** and her science/agriculture students at Federal Hocking Secondary School (Stewart, Ohio)

Classroom session (45-60 minutes)

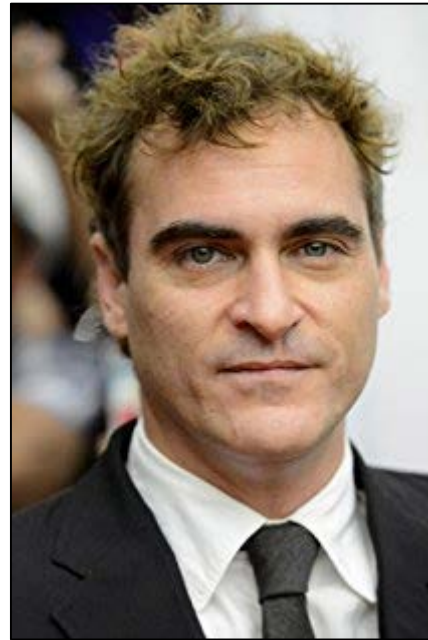
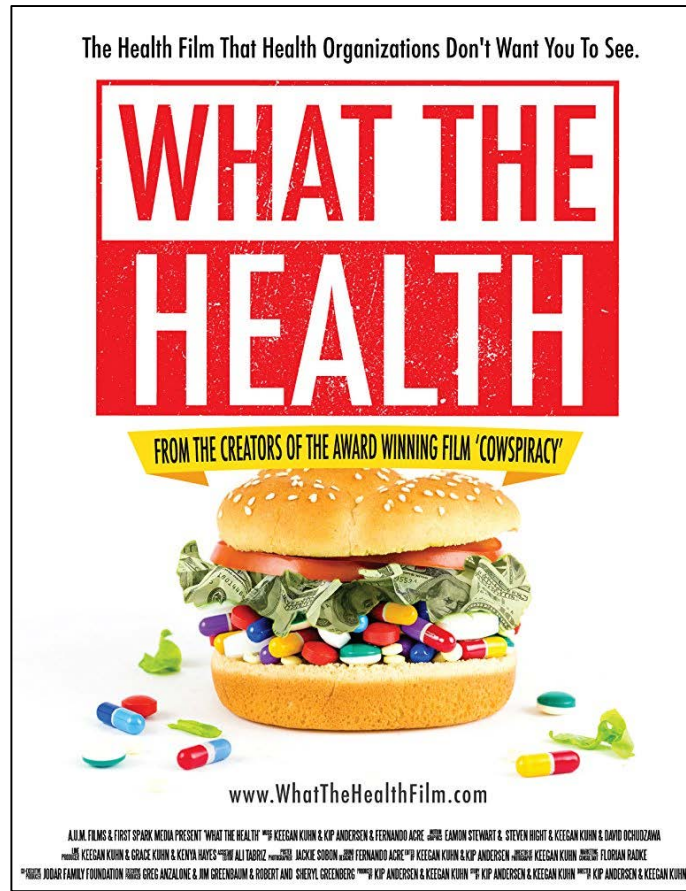
1. Introduction to cognitive biases
2. Introduction to What the Health (film)
3. Clip 1: Diligent clarification
4. Clip 2: Slow thinking
5. Clip 3: Humble self reflection
6. Wrap up

Have you ever?

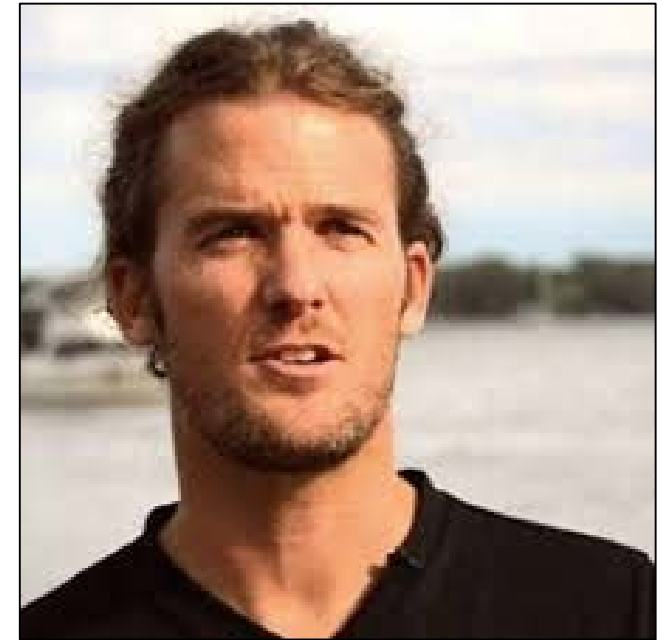
- Have you ever thought you understood something when really you didn't?
- This is sometimes called:
 - Overconfidence
 - Knowledge illusion
 - Dunning-Kruger Effect



What the Health (a documentary film, 2017)



Joaquin Phoenix
(executive producer)



Kip Anderson
(director, writer, star)

What might a person conclude from this clip?

Question: What do you think someone seeing this clip might conclude?

Possible incorrect conclusions:

- Dairy consumption greatly increases cancer risk.
- If I keep consuming dairy, I will probably get cancer?.
- Maybe I should stop consuming dairy.

Dairy can increase a man's chance of getting prostate cancer by 34%



How did the film make diligent clarification difficult?

Misrepresentation

Actual conclusion from the study:

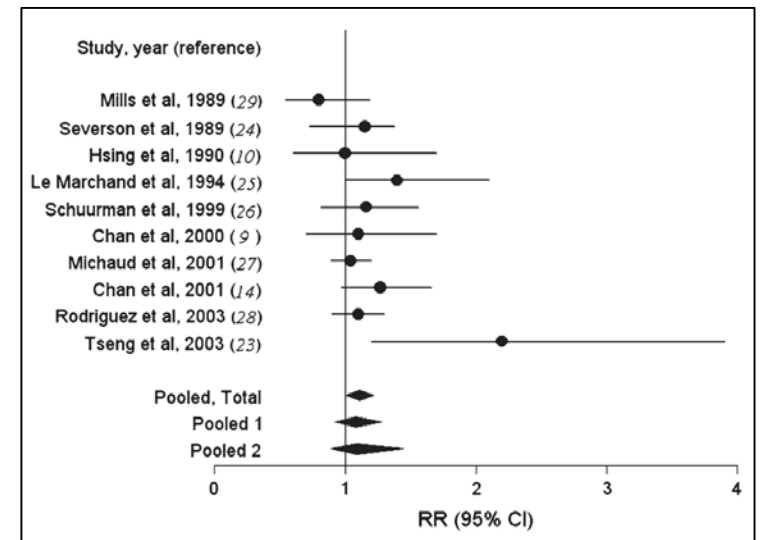
“... risk appears to be small.”

Relative risk vs. absolute risk

Relative risk:
34% increase

Absolute risk:
**2.4 deaths / 100 vs.
3.2 deaths / 100**

Selective evidence



What is diligent clarification?

1. Look beyond the headlines (since headlines might be wrong, or might overstate things). Look for the actual evidence.
2. Read beyond the first thing you find in an internet search.
3. Be skeptical. Ask questions.
4. Don't accept partial truths.

Dairy can increase a man's chance of getting prostate cancer by 34%



Let's think slowly:
Did going vegan cause his strength gain?

Question: Would going vegan cause strength gain in you, or in everyone? Explain.

I'm vegan and I'm bench pressing 465 pounds (before it was 315)



How did the film make slow thinking difficult?

Emotion-based reasoning

- Beautiful scenery
- David Carter is a very nice guy

Correlation is not causation

- Other diets may have similar impact
- Maybe his injury just healed

Anecdotal evidence

- Can't make good inferences from one observation

What is slow thinking?

1. Apply logic and probability.
2. Don't fall for anecdotal evidence, even if it's emotional.
3. Recognize that correlation does not mean causation.

I'm vegan and I'm bench pressing 465 pounds (before it was 315)

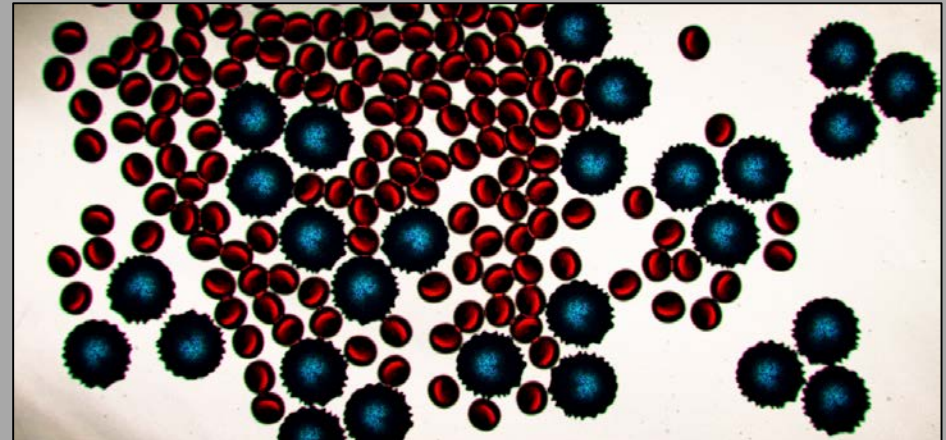


Let's humbly self reflect:
How sure are we about what we are looking at?

*... the BEST results ever achieved
were through a plant based diet*



*... after two weeks their bodies just
cleaned up ...*



How did the film make humble self-reflection difficult?

Confident expert ... or advocate

- We tend to believe confident experts (ignoring their potential biases)

Dunning-Kruger effect

- Knowing just a little can make us very confident

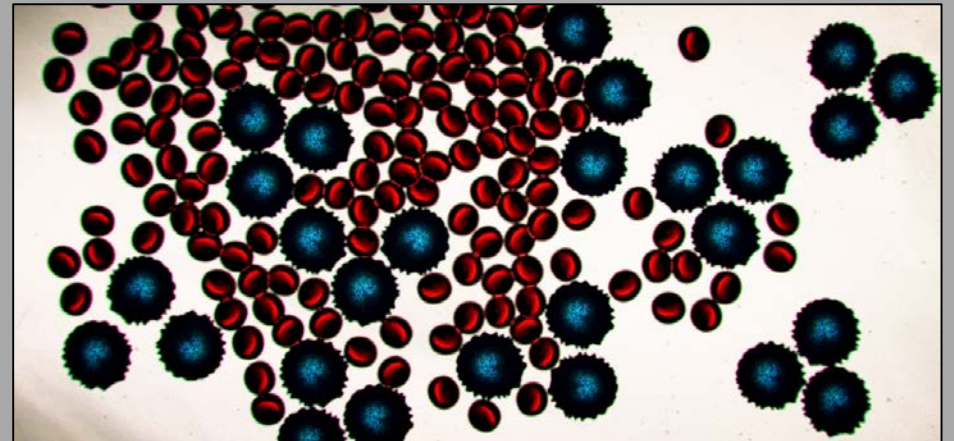
Knowledge illusion

- We feel we know how things work (e.g., bicycles) ... but don't really
- Animation can give false sense of knowing

What is humble self reflection?

1. Don't be too confident in your conclusions.
2. Expect the knowledge illusion: Familiarity and understanding are not the same thing.
3. Expect confident people, even experts, to be wrong sometimes.

... after two weeks their bodies just cleaned up ...



People are not “naturally good” at critical thinking

- Nobel Prize winning research has shown that people systematically make errors in critical thinking:
 - Confirmation bias
 - Confusing correlation for causation
 - Relying on anecdotal evidence
 - Overconfidence



Daniel Kahneman
(Nobel Prize, 2002)

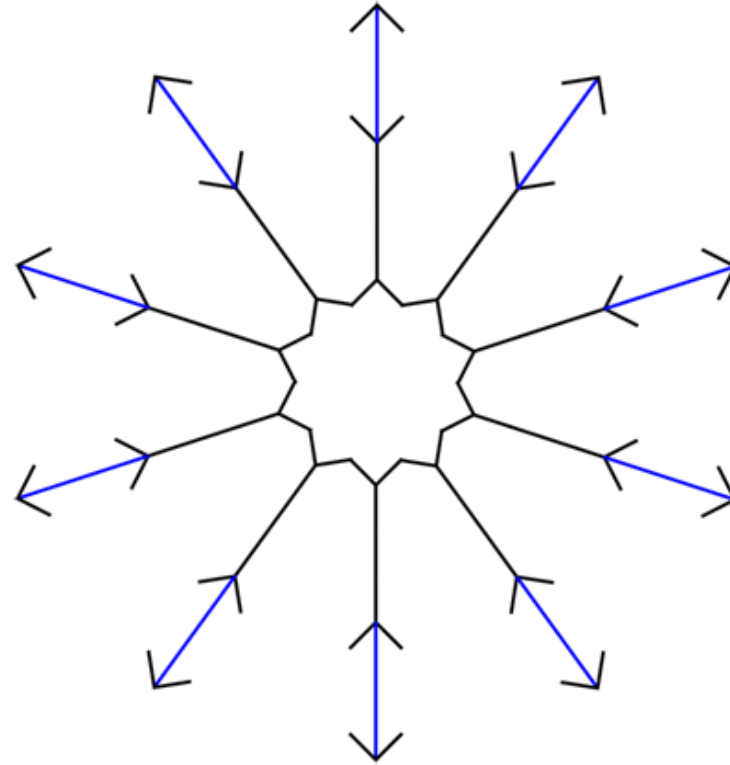


Richard Thaler
(Nobel Prize, 2017)

Thinking illusions are kind of like visual illusions

Sarcone's Dynamic Müller-Lyer Illusion

- The blue lines are not actually changing in size: It's an illusion!



Pilot Session: Feedback

Feedback

1. Misconceptions: Student misconceptions from film clips were clear (and some insight followed the discussions)
2. 8th graders were not interested in the “cognitive biases” discussion – it may be a better fit with 9th grade and up
3. Needed: Applications that are more mainstream (e.g., TV ads, celebrities)
4. Logistics: May need to show clips multiple times, could break up into multiple sessions

Next steps

1. Additional content (media examples)
2. Create modular sessions (to allow flexibility)
3. Develop student assessment opportunities

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Thank you!

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About us



Brandon McFadden, Ph.D.

- Assistant Professor, Food & Resources Economics, University of Florida.
- Research: Uses experimental economic methods to examine consumer perceptions of contemporary agricultural production and the mechanisms of food choice.
- Teaches: Agricultural & Food Marketing; Contemporary Issues in Agribusiness.



Jason Riis, Ph.D.

- Lecturer, Marketing, Wharton School, University of Pennsylvania.
- Research: Uses field experiments to assess healthy eating interventions and surveys to examine consumer perceptions.
- Teaches: Marketing; Consumer Behavior.