Framework for Thinking Critically About Science in the Media

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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, sometimes 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

1. Check the facts
   - Diligent Clarification: Check that claims of fact are true, unambiguous, and comprehensive.

2. Analyze them objectively
   - Slow Thinking: Make appropriate inferences based on logic, probability, and evidence.

3. Form a judgment
   - Humble Self-Reflection: Be clear about what is known and what is not known.

COGNITIVE BIASES
- Confirmation bias
- Affect heuristic
- Overconfidence
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.
How did the film make diligent clarification difficult?

Misrepresentation

Relative risk vs. absolute risk

Selective evidence

Actual conclusion from the study:

“... risk appears to be small.”

Relative risk: 34% increase

Absolute risk:

2.4 deaths / 100 vs. 3.2 deaths / 100
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.


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.
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

Thinking illusions are kind of like visual illusions

- 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

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- Research: Uses field experiments to assess healthy eating interventions and surveys to examine consumer perceptions.
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