

— Critical Thinking

Agenda



What is it?



Why are we learning this?



Doing it



Other considerations and next steps

Our Learning Goals

- Define critical thinking
- Identify the structure of an argument
- Learn helpful questions to ask when evaluating the quality of an argument



What is Critical Thinking?

Asking and answering critical questions when listening and reading.

- It's an active process
- Apply it to what YOU write and say

Why?

- It's assumed data scientists have this skill, but ...

rarely taught.

Conclusion

If you're over 70, you shouldn't run. If you run you might fall. People over 70 are at risk for lots of bad health outcomes if they fall.

What is the author trying to convince you to believe?

This is *the conclusion*.



Find the Conclusion

Are healthcare costs too high? Well, it costs a lot to pay for the very best medical equipment. And doctors have to go to school for a long time, so they need high salaries to incentivize them. So costs might be high, but it takes a lot of money to have good healthcare.

Reasons

- What reasons does the author give to support their conclusion?

Are healthcare costs too high? Well, it costs a lot to pay for the very best medical equipment. And doctors have to go to school for a long time, so they need high salaries to incentivize them. So costs might be high, but it takes a lot of money to have good healthcare.

Reasons

Are healthcare costs too high? Well, it costs a lot to pay for the very best medical equipment. And doctors have to go to school for a long time, so they need high salaries to incentivize them. So costs might be high, but it takes a lot of money to have good healthcare.



Conclusion + Reasons = Argument

- What's the author's argument?**

Assumptions

What is

- left unstated,
- taken for granted,
- necessary for the reasoning to make sense?

Conclusion, Reasons, Assumptions

The stockmarket is headed for a major crash. The forward price to earnings ratio is 21. The last time it was this high was just before the dot com crash.

Conclusion:

Reasons:

Assumptions:

<https://www.yardeni.com/pub/stockmktperatio.pdf>

P/E & PEG: S&P 500



* 52-week forward consensus expected S&P 500 operating earnings per share. Monthly from January 1979 through April 1994, then weekly.
Note: Shaded areas denote recessions according to the National Bureau of Economic Research.
Source: I/B/E/S data by Refinitiv and Standard & Poor's.

How good is the evidence?

- **Experimental stats**
- **Observational survey stats**
- **Intuition**
- **Testimonials**
- **Anecdotes**
- **Appeals to authority**
- **Analogies**

Example

You should see Dr. Branson for your knee surgery.
She did my wrist surgery and now my wrist is good
as new!

Evidence

In God We Trust; Others Must Provide Data

- Often attributed to W. Edwards Deming or Edwin R. Fisher

Evidence rating system

The War for Kindness - Jamil Zaki

Has a rating system for the claims it discusses.

- “A rating of 1 indicates that there’s not yet a great deal of evidence supporting the claim – perhaps the research is new or has yet to be replicated. A rating of 5 indicates a claim rests firmly on many studies.”

<https://www.warforkindness.com/data>

Are there any fallacies in the reasoning?

Reasoning errors

- **Confusing what should be with what is**
- **Begging the question/circular reasoning**
- **Distracting with emotional language**
- **Ad hominem attacks (attacking the author's character)**
- **Attacking an argument for not being perfect**

Are there any fallacies in the reasoning?

A comprehensive national health insurance plan would be wasteful. Thus, passing such a bill would cause a great deal of harm. Because the bill would be so harmful, it's a very wasteful bill.

-adapted from Asking the Right Questions (5th Ed) p.94.

What are the counterarguments?

High school children today are in a sleep deficit crisis. They get only six hours of sleep a night on average. Teenagers bodies are pre-disposed to stay up later and wake up later. Consequently high school classes should start at 9am.

Other issues

- Ambiguity

- Value conflicts

Summary

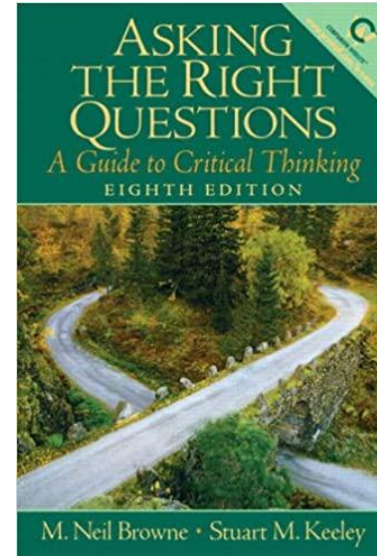
- **What does the author want me to believe?**
- **What reasons does the author give?**
- **What are the unstated assumptions?**
- **How good is the evidence?**
- **Are there any fallacies in the reasoning?**
- **What are the counterarguments?**

Conclusion

- When to use
- Next steps - projects

This is adapted from Asking the Right Questions - Browne and Keeley

<https://www.amazon.com/Asking-Right-Questions-Critical-Thinking/dp/0132203049>



Switch gears



— Presenting is a game



Source: <https://health.clevelandclinic.org/can-kids-play-sports-this-summer-with-the-coronavirus-hanging-around/>



— Slides

Structure first

Outline

- Intro
- Body
- Conclusion

Intro

- Hi! My name is
- Question/topic/story - set the stage



What's your main point?




Focus



Body

Argument



If I had more time, I would have given a shorter presentation.

Audience

- The reason you are here
- Signals



Conclusion

- Restate main point
- Finish strong
 - question
 - thank

— Slides

Example:

Developments: 1990s

- Global competition:
 - International trade agreements open new markets for expansion & lower barriers to the entry of foreign competitors (e.g.: NAFTA & GATT)
 - Creates the need for decision-making tools for facility location, compliance with local regulations, tailoring product offerings to local tastes, managing distribution networks, ...
- Environmental issues:
 - Pressure from consumers & regulators to reduce, reuse & recycle solid wastes & discharges to air & water

Source:

https://www.slideshare.net/vc_santos/production-and-operations-management-chapter-18?qid=87e5c002-34c8-4e95-a18d-d140315f8d7d&v=&b=&from_search=112

Layout

- Can you read and listen at the same time?
- Nothing smaller than 24pt font

Do it for the kids

- Please, don't read your slides

Background

- Plain is a bit boring, but #1 rule:

Don't distract



Examples of good presentations

- Slides

Chris Wiggins <https://www.slideshare.net/chrishwiggins/data-science-nyt-inaugural-data-science-initiative-lecture/93>

- TED talks (surprise!)
- Share others in resources thread

— Preparation

Practice, practice, practice

What have you found works well in terms of practice tips?



—
Go Time



What does a runner do before a race?

- Shake it out
- Stand tall
- Nervous is normal

What does a runner do before a race?

- Deep breath
- Game face
- If possible - find your engaged, supportive person

—
Improving



Improving at the game


- Practice
- Perform
- Feedback

Improve at the game

- Own path
- Growth mindset
- Always another level

Takeaway

Public speaking is a game 

- You can improve at it! 
- Practice, perform, get feedback...
- and you will!



What other speaking tips do you have?

