Navigating Science Media

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WORKSHOP OVERVIEW

What is science?

How is science communicated?

How do we evaluate science media?

How do we communicate science responsibly?



Science is...



Science is built on the contributions of many different scientists

Collaborative



Science is a systematic process of idea formation, data collection, and data interpretation

A process or method



All science-based ideas must be supported by carefully acquired evidence

Evidence-based



Science constantly
evolves, which often
requires revising ideas,
experiments, and
interpretations

Slow, imperfect, nonlinear



Science is an effective and rigorous way to develop ideas and information

Effective



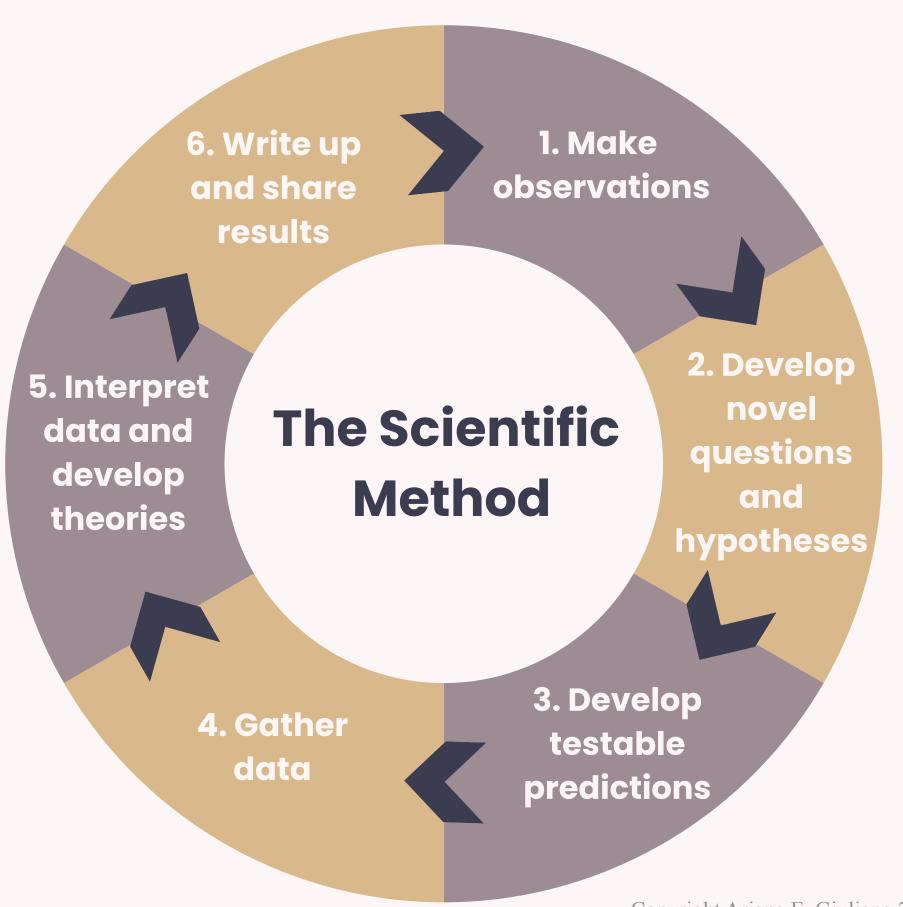
Helpful Definitions

Hypothesis: An evidence-based prediction

This is what is **tested** in scientific studies.

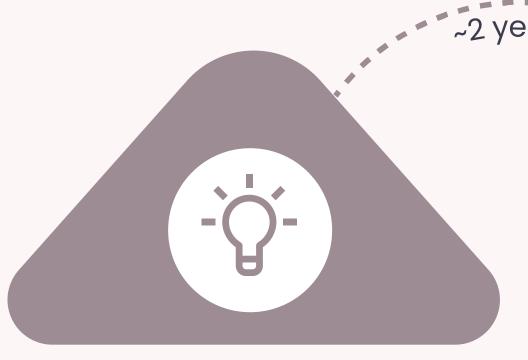
Theory: An evidence-based idea or set of ideas that explain something

This is what is **developed** based on the results of the study.





The Evolution of Scientific Information



Ideas and Experimentation

Shared among a specific research team

Publication in Scientific Journal

Published for a scientific community

Contains jargon and disciplinespecific writing conventions





Summarized Articles in the Media

Summarized for general public

Translated from scientific language



SCIENCE LITERATURE

Written by experts in the topic

Reviewed by other experts in the field

More quantitative

Primary source

JOURNALISM

Written by experts in journalism

Edited by non-experts

More qualitative

Secondary source (for science)

NOTE: There is room for error in both science and journalism. Good journalism will report science responsibly.



Scientific Peer Review



STEP 1

Write the article

Using recent and past literature, explain how you tested your ideas and what the results mean



STEP 2

Submit for peer reivew

Choose your journal and submit your manuscript for review by other experts in the field

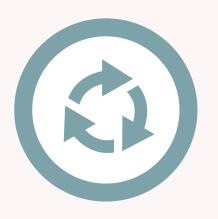


STEP 3

Receive decision, revise writing

The journal accepts or rejects your article

If accepted, make changes based on your peer-reviewers' feedback



STEP 4

Resubmit article

Article is submitted for a second round of peer review



STEP 5

Receive new decision

Opportunity to make revisions before final submission



WHY DO WE PEER REVIEW?

Scientific rigour

Theoretical accuracy

Collaboration

Bias mitigation

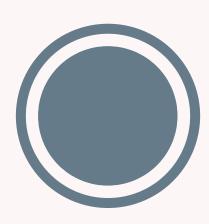




Science Literacy

Ability to ask, find, or determine answers to scientific questions







SAMPLE SIZE & DIVERSITY

Is the number & diversity of people participating in the research enough to draw meaningful conclusions?



IMPLYING CAUSATION

Be wary of associations being framed as causal relationships.

E.g., saying "X causes a change in Y" is different from saying "X changes as Y changes"



CONFLICTS OF INTEREST

Who is funding the research?

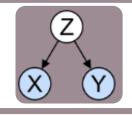
How does the funding body benefit from the research?



VAGUE/EXAGGERATED CLAIMS

Is there vague or missing information?

Do the claims sound too good to be true?



CONFOUNDS

Could something else better explain the relationship between X and Y?



NO LINK TO ORIGINAL SOURCE

Do the authors cite and reference the source material?



Case Study #1



SAMPLE SIZE & DIVERSITY

Only 5 cities were studied and there is no mention of where these cities are in the world

STUDY PROVES THAT ICE-CREAM CAUSES WARM WEATHER

study --recent involving that showed sales caused warmer highly weather. This study scientists funded Larry's Cream lce Company, who are now suggesting that cities should sell more ice cream if they would like to increase their summer

temperatures. The cities data was collected in an the summer months increase in ice cream of 1999 by a group of trained and was published and trainees. our advice to by Len & you this summer is to make sure you buy ice cream.



Case Study #1



IMPLYING CAUSATION

Just because ice cream sales and temperature both increase at the same time does not mean that ice cream sales cause warmer weather

Correlation is not the same as causation

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Case Study #1



CONFLICTS OF INTEREST

This "company" has a vested interest in selling ice cream, which may introduce bias in reporting the results

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Case Study #1



VAGUE/EXAGGERATED CLAIMS

This is an extreme claim to make based on only one study with other obvious issues

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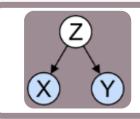
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Case Study #1



CONFOUNDS

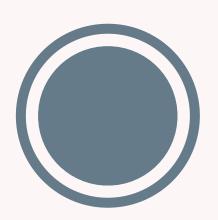
Data was collected during summer, which may better explain the relationship between ice cream sales and temperature

i.e., temperatures are higher in summer, more likely to buy ice cream in summer

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NO LINK TO ORIGINAL SOURCE

There is no in-text citation, nor any reference linking to the source information

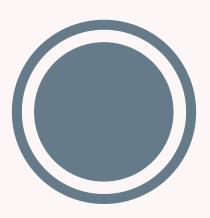
Linking to the original source allows the audience to review the source material and draw their own conclusions

Case Study #1

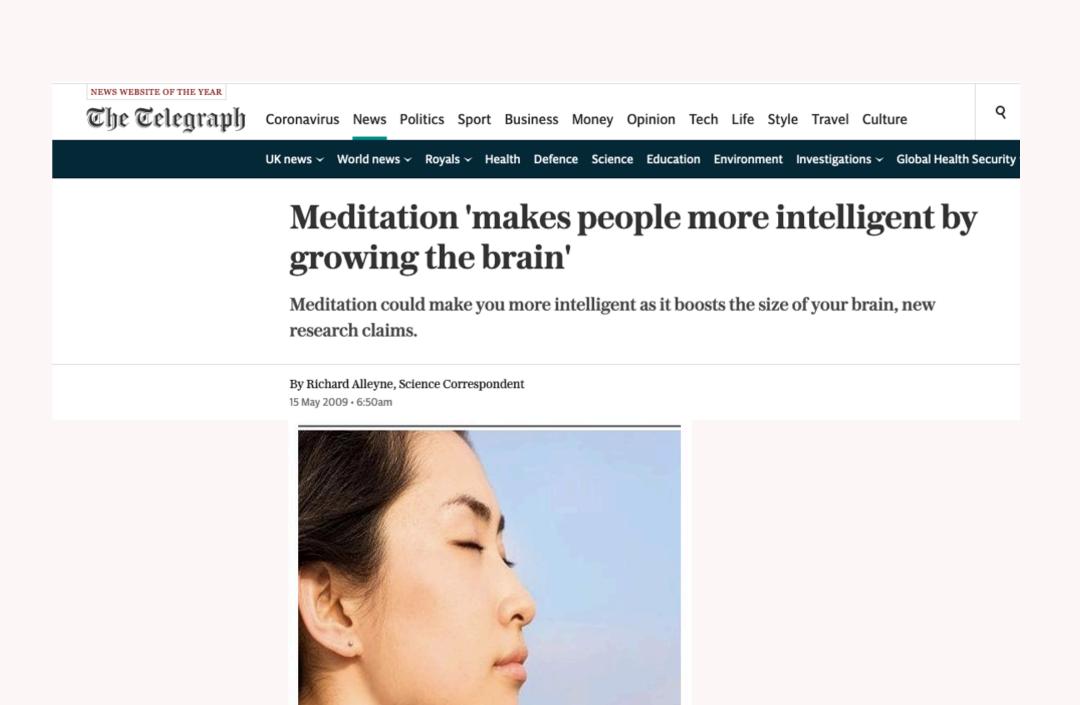
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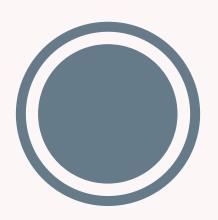


Case Study #2



Now scientists have discovered that regular meditation appears to actually

increase the size of the brain Photo: GETTY





IMPLYING CAUSATION

Case Study #2

ARTICLE CLAIM

Meditation makes people more intelligent by growing their brain

Causal claim

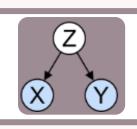
ORIGINAL CLAIM

A study revealed that people who meditate consistently, had a bigger hippocampus—a key area of the brain associated with memory and learning

Association

"Obviously, the outcomes of the current study do not provide any indicators for a causal relationship between the long-term practice of meditation and brain structures." (Luders et al., 2009)





CONFOUNDS

Case Study #2

Hippocampus

Size

Attentional Abilities

The hippocampus is involved in attention. Hippocampus size could in part be due to differences in attentional abilities (Newberg & Iverson, 2003).

Exercise Habits

People who have consistent aerobic exercise habits tend to have larger hippocampi (Erickson et al., 2011).

Education Level

Being highly educated is associated with hippocampal measurement differences across the lifespan (Noble et al., 2012).

Dietary Factors

A quality diet has been associated with larger hippocampi (Akbaraly et al., 2018).





VAGUE/EXAGGERATED CLAIMS

Case Study #2

VAGUE CLAIM

The brain scans showed "significantly larger **cerebral measurements** in meditators"

Original study
measured a specific region

FABRICATED CLAIM

Meditating makes people more intelligent

Intelligence was never measured



NO LINK TO ORIGINAL SOURCE

Case Study #2



HOW DO WE COMMUNICATE SCIENCE RESPONSIBLY?

Talking to Friends and Family about Science



Always support your opinions with evidence

Provide Evidence



Include all the details, even those that don't support your opinion or belief

Be Honest



Acknowledge when your information is based on personal experience

Acknowledge Bias



Listen and discuss openly

Everyone has different experiences and evidence to share

Listen and Discuss



If new, compelling evidence is presented, don't be afraid to change your opinion

Be Flexible

Take-Home Messages

WHAT IS SCIENCE?

Science is a cyclical,
evidence-based
process of gathering
and sharing
information

Science is constantly evolving

HOW IS SCIENCE COMMUNICATED?

Science literature and journal articles are reviewed differently

The peer-review process is designed to increase collaboration and mitigate bias

HOW DO WE EVALUATE SCIENCE MEDIA?

Be critical and cautious when consuming science media, even information from peer-reviewed journals

Evaluate the factors we discussed earlier (e.g., conflicts of interest)

COMMUNICATE SCIENCE RESPONSIBLY

Engage in conversations about science with others and keep an open mind

Always back up your claims with evidence

Thank you for your time and attention.

Any questions?



References

Akbaraly, T., Sexton, C., Zsoldos, E., Mahmood, A., Filippini, N., Kerleau, C., Verdier, J. M., Virtanen, M., Gabelle, A., Ebmeier, K. P., & Kivimaki, M. (2018). Association of Long-Term Diet Quality with Hippocampal Volume: Longitudinal Cohort Study. The American journal of medicine, 131(11), 1372–1381.e4. https://doi.org/10.1016/j.amjmed.2018.07.001

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