

Week 9.1: Pathological Science Case Studies

Same-group article discussion (10 minutes)

Assign a Spokesperson (whoever has the darkest colored shirt) and a Notetaker (whoever has the lightest colored shirt). Take 10-12 minutes and discuss the article your group read, using the summary provided to supplement your discussion. The Notetaker should make a copy of this file and take notes under each question. Be prepared to recap only the facts of your article to other groups by the end of this discussion.

Here are the sorts of questions you should think about and be ready to include in your factual presentations to the other groups. Note that not all questions may apply to each article.

Notes for Article _____ (your own article):

- What was the research question and hypothesis?

- What variables were tested?

- Do you have a sense that there were other confounding factors that were controlled for?

- How did the scientific community respond? How did the scientists who conducted the research respond to the scientific community?

- What did the scientists conclude? What did the scientific community conclude?

Jigsaw Share (25 minutes)

Your GSI will put you in mixed groups so that you can share with each other what each article was about.

Someone from your group should verbally summarize their article to the other groups (ex: Group 1's Spokesperson presents their article to Groups 2&3) using the notes you took on the above questions. This should be completed in about 3-5 minutes. The groups that are listening to this summary should ask clarifying questions, and the Notetaker for each group should take notes on the presenting group's article in the outline below. Repeat this until all groups have presented their article. If there is time remaining at the end of group presentations, begin discussing the questions at the end of the student handout.

Notes for Article _____ :

- What was the research question and hypothesis?

- What variables were tested?

- Do you have a sense that there were other confounding factors that were controlled for?

- How did the scientific community respond? How did the scientists who conducted the research respond to the scientific community?

- What did the scientists conclude? What did the scientific community conclude?

Notes for Article _____ :

- What was the research question and hypothesis?

- What variables were tested?

- Do you have a sense that there were other confounding factors that were controlled for?

- How did the scientific community respond? How did the scientists who conducted the research respond to the scientific community?

- What did the scientists conclude? What did the scientific community conclude?

Whole class discussion (25 minutes)

1. Where would this article fall in the following continuum, and why would you argue this?
 - a. Good scientific practice, right results
 - b. Good scientific practice, wrong results
 - c. Poor scientific practice, right results
 - d. Poor scientific practice, wrong results
 - e. Pathological science
 - f. Pseudo-science
 - g. Fraudulent science
2. Discuss which of Langmuir's criteria (if any) apply to this article, citing quotes and/or evidence from the article to explain your reasoning:
 - a. The effect is produced by a barely detectable cause, and the magnitude of the effect is substantially independent of the intensity of the cause.
 - b. The effect is barely detectable, or has very low statistical significance.
 - c. Claims of great accuracy.
 - d. Involving fantastic theories contrary to experience.
 - e. Criticisms are met with ad hoc excuses.
 - f. Ratio of supporters to critics rises to near 1:1, then drops back to near zero.
3. Where, if relevant, did this science go wrong?

For Reference:

Spectrum of poor research:

- Good Science that gets the wrong answer. (with a confidence interval of 95%, 5% of the time results will be wrong)
- Poorly done science (done honestly, not well)
- Pathological science (See Langmuir's criteria)
- Pseudo-science (using scientific vocabulary without aligning with the corresponding concepts or real scientific practices)
- Fraudulent Science (involves intentional deception, such as deliberately fabricating data or deceiving the reader about the strength of evidence).

Langmuir's Pathological science indicators:

- The effect is produced by a barely detectable cause, and the magnitude of the effect is substantially independent of the intensity of the cause.
- The effect is barely detectable, or has very low statistical significance. Claims of great accuracy.
- Claims of great accuracy.
- Involving fantastic theories contrary to experience.
- Criticisms are met with ad hoc excuses.
- Ratio of supporters to critics rises to near 50%, then drops back to near zero.
- Conclusion-motivated design & analysis.