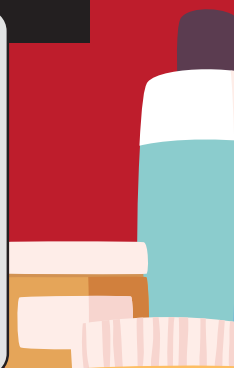


11 CHARACTERISTICS OF PSEUDOSCIENCE

AUTHOR: MELANIE TRECEK-KING



1. Is UNFALSIFIABLE

It can't be proven wrong. It makes vague or unobservable claims.

There's a viral infection that we must be careful of.

That is a broad claim. What makes you sure that the amulet will protect you against this infection?

But... you were coughing & sneezing just last week.

Ah! What kind of weather change triggers that?

But it rained only on one day. You were coughing & sneezing on two very hot & dry days before that. I remember we were all burning up in the heat, but didn't want to switch on the fan because you were unwell.

Looks like there's nothing that would make you doubt your belief in the amulet's power?

I am not worried — my amulet boosts immunity & fights all infections.

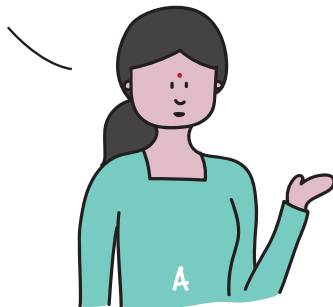
I have proof — I have observed that as long as I keep wearing it, I don't catch infection.

That was an allergy to the change in weather.

Sudden rains.

My body could sense that it was going to rain — it triggered my allergy.

That's right. I have complete confidence in it.



2. Professes CERTAINTY

Talks of "proof" and presents ideas with complete confidence.



THINK ABOUT

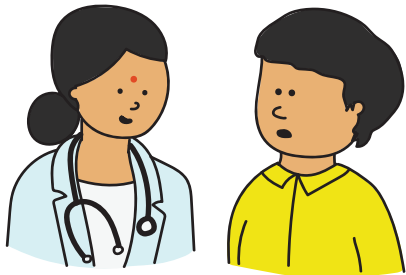
Say A brings this magical amulet to you (at great risk to B's health):

Q. How would you test if the amulet boosts immunity? What kind of evidence would you look for?

Q. How would you test if the amulet protects against every single (all) infection in the world? When would you be completely certain of this property?

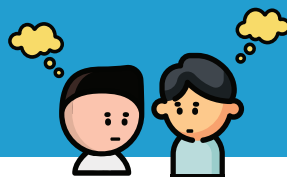
3. Relies heavily on ANECDOTES

The evidence largely comes from personal experiences and testimonials.



My friend's grandmother's sister would walk up this hill and circle this tree on the hilltop three times every morning. She did this every day for a year. By the end of the year her cancer had disappeared. All the doctors treating her were amazed – they called it a miracle.

THINK ABOUT



- Q. How would you test if this walking routine really cured the man's friend's grandmother of cancer? What kind of evidence would you look for?
- Q. How certain do you feel that this cure would work on other people suffering from cancer? What would you need to know to arrive at this conclusion?

4. Uses TECHNO BABBLE

The words sound scientific but are used incorrectly or don't make sense.

This gemstone, when worn correctly, attracts alpha waves from the universe that get transmitted to the limbic system of the brain through the nerves in your finger, thereby enhancing positive emotions and mental peace.

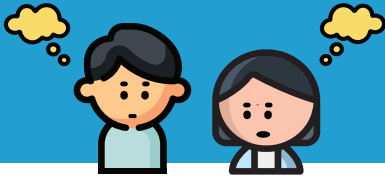


You are as depressed as ever! You need professional help, not a gemstone. Who knows if it even works!



Didn't you hear what the shopkeeper said? I just have to figure out how to wear it correctly.





THINK ABOUT

Your friend C comes to you for advice. What part of the jeweller's claims about the gemstone's effects on mental peace are used incorrectly or don't make sense? Why do you think so?

5. CHERRY PICKS evidence

Uses favourable evidence while ignoring or minimizing disconfirming evidence.

Oh, just a matter of dosage!



THINK ABOUT

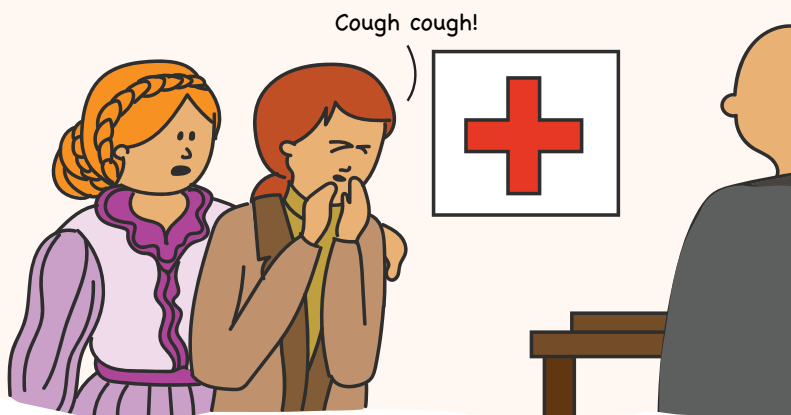


Look at the chart showing the results of a test study. What kind of evidence has been ignored?

6. Lacks PLAUSIBLE MECHANISM

There's no way to explain how the claim might work based on existing knowledge.

Somewhere in 19th century Britain....



Doctor, how does bloodletting cure pneumonia?

I don't think we know for sure yet.

That Austrian scientist — Joseph Dietl? His study shows that the mortality rates of pneumonia patients who received bloodletting treatment are three times higher than those of pneumonia patients who do not receive it.

We have been using this treatment for centuries. I don't see any reason to change it now.



7. Is UNCHANGING

Doesn't self-correct or progress.



THINK ABOUT

If you were the doctor and had just heard of Dietl's study:

- Q. Under what conditions would you continue using bloodletting to treat pneumonia patients?
- Q. Would you question or change anything about the procedure (like its length, frequency)?
- Q. Would you question or change anything based on the patients' health (their age, stamina, the severity of their symptoms)?
- Q. Would knowing how bloodletting was believed to cure pneumonia patients help you decide whether you wanted to use it in this particular case? In what way?

8. Makes EXTRAORDINARY/ EXAGGERATED CLAIMS

Promises extraordinary benefits with insufficient evidence.

 <p>Slim down instantly with our all-natural body shaper!</p> <p>CALL NOW!</p> <p>Free trial. Immediate results.</p>	<p>Free trial! 100% guaranteed to lose 30 kg within 10 days. No dieting. No exercise. Sleep your way into a slim body. No side effects.</p>
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THINK ABOUT

Your friend comes to you for advice. What part of the claims in the advertisement for the all-natural compressor technology seems exaggerated to you? Why do you think so?

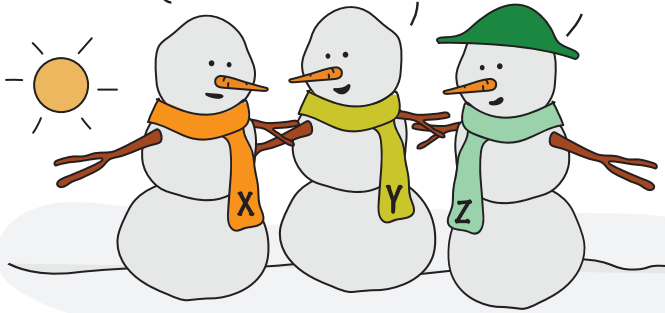
9. Commits LOGICAL FALLACIES

Arguments contain errors in reasoning.

The slimming pills are working. I am not as round as yesterday.

You are one of the oldest, wisest snowmen I know. If you say so, it must be true!

Of course, it works! You are the fifth snowman I have heard from today. Every one of them thinks they are losing weight.



PEER REVIEW

1. Is this the effect of standing outside on a hot day? Has this happened on a sunless freezing winter day too?
2. Did you measure the rate of weight loss in all 5 snowmen? Where does it occur – all over the body or in some specific areas?
3. Is there a measurable difference in weight loss between those who have taken the pill and those who haven't?
4. Is 5 a large-enough number to draw such conclusions?
5. Does the pill have any side effects?

10. Lacks adequate PEER REVIEW

Avoids critical scrutiny by the scientific community.

THINK ABOUT



Your friend comes to you for advice.

Q. Is there an error in reasoning in

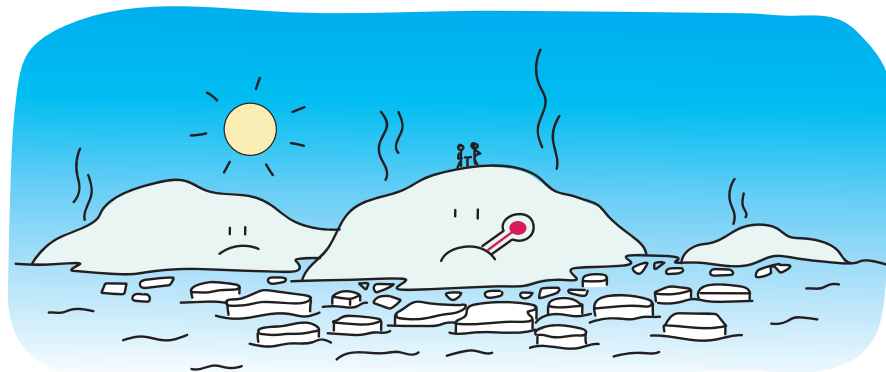
- a) Snowman X's conclusion?
- b) Snowman Y's reason for believing in Snowman X's conclusion?
- c) Snowman Z's statement?

Q. If Snowman Z shared their findings with you for peer review, what questions would you ask? Is there something that the other reviewers haven't asked yet?

11. Claims there's a CONSPIRACY to suppress their ideas

Criticism by the scientific community is a conspiracy.

Did you hear about the climate change 'conspiracy'? Apparently environmental organisations are conspiring with scientists to fudge climate data because they want fossil fuel companies to go bankrupt and the world economy to crash!



THINK ABOUT

The dictionary uses the word 'bias' to describe a tendency to feel or show inclination or prejudice for or against someone or something. The two men drilling for oil seem to be suggesting that climate scientists may be biased against fossil fuel companies. Bias can influence what questions scientists ask, what methods they use to collect evidence, how they interpret evidence, and what they present for review and publication.

Q. Have you felt biased towards something or someone? How has this influenced your ability to ask questions, look for evidence, and arrive at conclusions?

Q. If you were a climate scientist, what would you do to reduce the likelihood that a bias against oil drilling in the arctic may affect your study?

- Do you think this list is exhaustive? Are there other characteristics that you would add to it? If yes, also share why you think they deserve a place here.
- Can you find examples (from the newspaper, your textbook, or any other source) for each of these characteristics? Do any of your examples show only one of these characteristics?

ABOUT THE AUTHOR:

Melanie Trecek-King is an Associate Professor of Biology at Massasoit Community College in Massachusetts. With over twenty years' experience in college and high school classrooms, she especially enjoys teaching students who don't want to be scientists when they "grow up." Her passion for science education led her to create "Thinking Is Power" to provide accessible and engaging critical thinking information to the general public and to other educators interested in incorporating more critical thinking content in their courses. The content for this poster has been taken, with her permission, from a post titled '11 Characteristics of Pseudoscience' (URL: <https://thinkingispower.com/11-characteristics-of-pseudoscience/>) from "Thinking Is Power". To read the entire post & access other related material, visit: <https://thinkingispower.com/>.

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11 CHARACTERISTICS OF PSEUDOSCIENCE

A publication by:

i wonder...
Rediscovering school science

