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Fake News and STEM

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Author Disclosure: I have a PhD in Statistics with a minor in science. This background allows me to teach math, statistics and science at community colleges and for profit universities. I have been doing this for over 10 years.

Math likes to think it is above the fray of Fake News. You have a formula, you plug in values, and you do the arithmetic to get a correct answer. All true, but sometimes a researcher may have the wrong formula. The values could be the wrong ones, and researchers have been known to do the arithmetic incorrectly. Any of these would lead to the wrong answer, and the researcher (not realizing this) would publish it. Since readers often feel "numbers don't lie," this is the math version of Fake News.

In statistics, we know numbers lie all the time, and the users of numbers lie even more often. A researcher may have bad luck and gather a sample that is not representative of the population the researcher is investigating. The wrong measurements might be taken or the wrong questions asked. The analysis might be done incorrectly. The conclusions drawn might be unsupported. I spend a lot of time in my statistics classes teaching students how to detect "Lying with Statistics." For example, a dataset has a mean of 73, a median of 50, a midrange of 60, and a mode if 15. Students are appalled to discover that, since all of these measurements are "averages," a researcher can (in all truthfulness) say "The average for the data is _____ (fill in whichever value proves your point)."

The scientific method actually is the best insurance against fake science. A researcher proposes a hypothesis to answer a question. Research is done and measurements taken. Analysis follows with conclusions drawn from the results. The results must then be evaluated by peers before publication. The published results must then be replicated by other researchers who publish their results. When there is a great deal of evidence for the hypothesis, it is then elevated to the status of a "theory". So a scientific theory is a consensus opinion based on many investigations all producing evidence that the theory is true.

This is all well and good for scientists - unless the universe is conspiring against us, we'll probably have theories which are true - but it is not only scientists who read the research.

In my science classes, I assign students do a project. While the majority of students do something that qualifies as "science," every so often a student will select a topic that I can only classify as "pseudoscience" - something that sounds like a scientific hypothesis but which has little or no research evidence supporting it. Pseudoscience is the science version of Fake News. The classic example is: astronomy (science) vs. astrology (pseudoscience).

Students mistake pseudoscience for science for a variety of reasons:

1) They do not yet have the experience to know what is accepted among scientists and what is not.
2) Pseudoscience literature carefully mimics science literature with numerous learned-sounding citations and technical terms so that is sounds "real."
3) Pseudoscience conclusions often sound more interesting/fun/cool/sexy than real science.

4) Science is often hard to understand or even counter-intuitive. Conclusions often appear to contradict deeply-held religious or cultural values. Pseudoscience is clear, easy to understand, and appeals to cultural and religious expectations.
5) Contrarians find the idea appealing that "all the big-shot scientists have it wrong."
6) It is easier to accept what you are reading as "true" than to go to the trouble of being skeptical and finding why it might not be true. This is especially true for something whose conclusions you want to believe are true.

Students accept pseudoscience because they WANT to. This could be true of all forms of Fake News.