Facts alone fall short in correcting science misinformation

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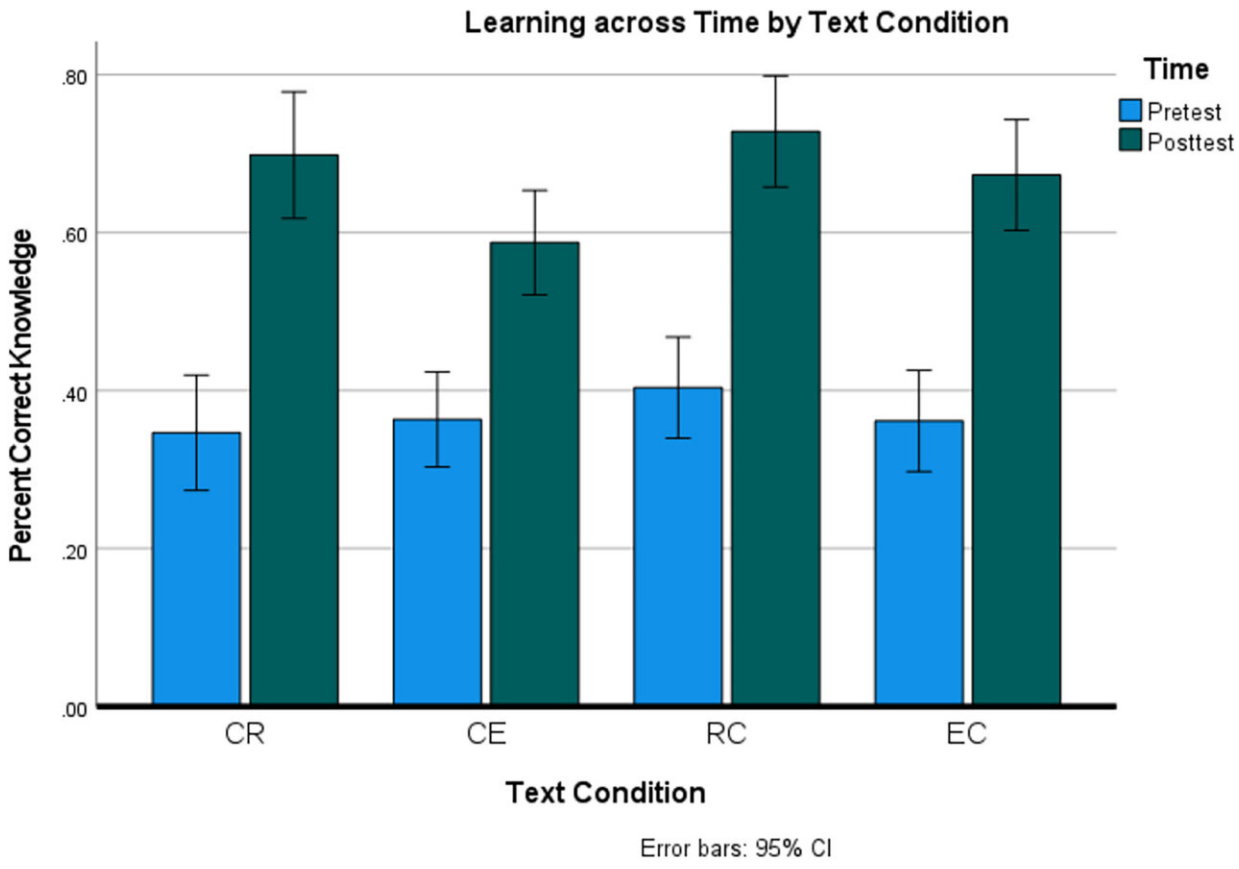

Danielson, R. W. Bar chart for learning across time by text condition. CE, contamination/expository; CR, contamination/refutation; EC, expository/contamination; RC, refutation/contamination. *Journal of Research in Science Teaching* (2024). DOI: 10.1002/tea.21963

Just the facts may not be enough to overcome misinformation, a recent study indicates.

In an experiment, 152 college students who had been exposed to misinformation read one of two articles intended to give them the correct, scientifically backed information. Those who read an expository article that had "just the facts" retained more misconceptions than those who read an article with a refutation—meaning it specifically called out the false claims before presenting the facts.

The study published in Journal of Research in Science Teaching adds evidence that a refutation approach may be a better way to combat misinformation than traditional methods of communicating science.

"Refutational approaches seem to work really well," said lead author Robert Danielson, a Washington State University educational psychology researcher. "While it's always best to get out in front as a teacher or communicator, students have smartphones. They're going to run into misinformation quickly. If we take this refutational approach, we're more likely to overcome misinformation."

For this study, researchers first tested what the student participants knew about putting fluoride in water. The students then read two articles: one with false information saying that fluoridation is harmful and another presenting the scientific consensus that has found fluoridation is safe and prevents dental disease.

The participants all read the same misinformation text, but different groups read an article with the correct information either in a traditional "just the facts" style or one that first refuted the misinformation. The study also tested the effects of having the participants read the correct article before, or after, the misinformation.

A post-test revealed that the students still learned under all four conditions—but the group that performed the worst had seen the misinformation first, followed by a "just the facts" type text. Those who had read the refutation article either before, or after, the misinformation had fewer misconceptions. They also had more positive emotions toward the subject.

With a profusion of information easily available on the internet, it can be hard for many people to sort fact from falsehood. This can cause a problem researchers call "conceptual contamination"—when learning incorrect information interferes with learning the correct information.

"Your mind doesn't discriminate for content. Whether it's a correct conception or a misconception, it just kind of absorbs it all," Danielson said. "People can learn misconceptions pretty easily, and there's no shortage of that online."

Educational researchers like Danielson are looking for ways to teach science that break through the noise of misinformation. This study and others show that a refutation approach is promising.

The researchers chose fluoridation for this experiment because it is less politically charged than other scientific topics like climate change or evolution. However, Danielson and his colleagues recently did a meta-analysis published in the journal *Educational Psychologist* of 76 other educational studies. They found the refutational approach works well for a wide range of topics from noncontroversial issues in physics and chemistry to highly controversial ones including climate change and evolution as well as genetically modified foods and vaccines.

"Some misconceptions can be relatively innocuous, like when a child thinks that chocolate milk comes from brown cows," Danielson said. "But for other things, like deep-seated misconceptions about the safety

and efficacy of vaccines, there could be some real serious down-the-road implications, not just for you, but for future generations as well."

More information: Conceptual contamination: Investigating the impact of misinformation on conceptual change and inoculation strategies, *Journal of Research in Science Teaching* (2024). DOI: 10.1002/tea.21963

The effectiveness of refutation text in confronting scientific misconceptions: A meta-analysis, *Educational Psychologist* (2024). www.tandfonline.com/doi/full/1 … 0461520.2024.2365628

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