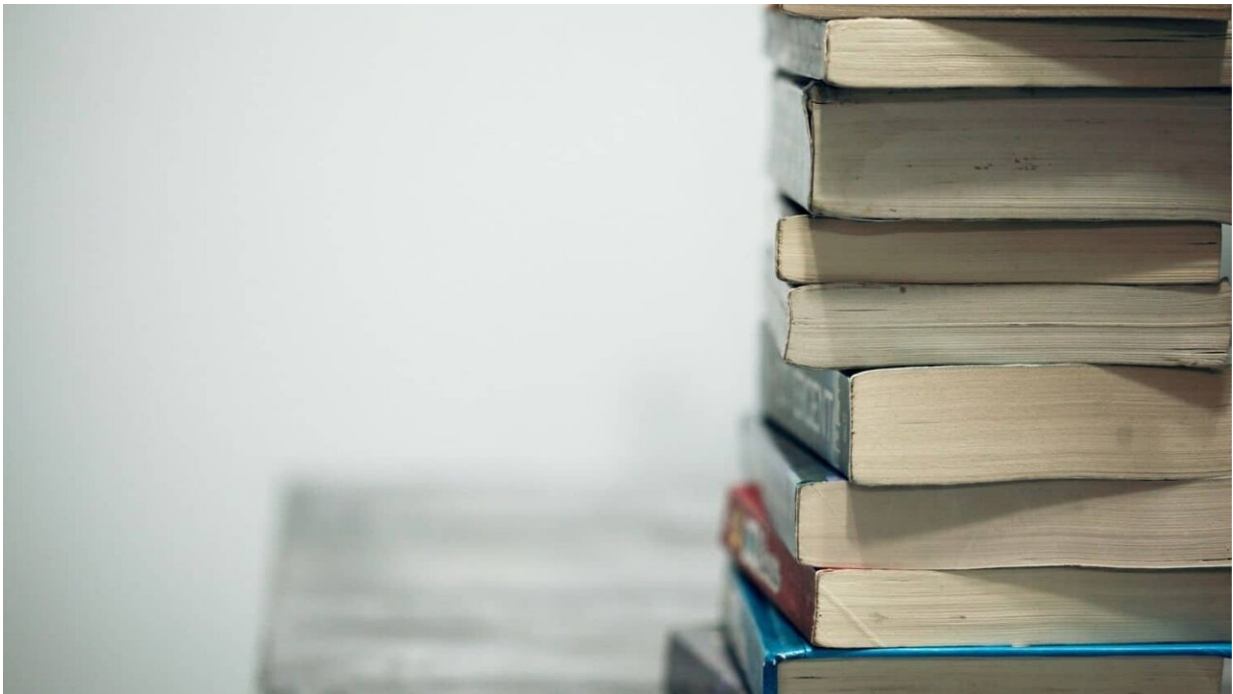


# Uncertainty on climate change in textbooks linked to uncertainty in students

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A new study from North Carolina State University suggests textbook wording that portrays climate change information as uncertain can influence how middle and high school students feel about the information, even for students who say they already know about climate change and its human causes.

The study, published in the journal *Environmental Education Research*, has implications for how teachers can prepare students to face misinformation about [climate change](#).

"I thought students' knowledge or [social norms](#) surrounding [climate change](#) would buffer them from misinformation," said study author K.C. Busch, an assistant professor of STEM education at NC State. "But it didn't matter how much knowledge students had; they did not react to the text differently. That's problematic. We think that if we could improve students' knowledge, they can integrate that knowledge in the real world to sniff out misinformation or disinformation that's being presented to them. That didn't happen."

In the study, Busch surveyed 453 students in California about how certain they felt about climate change before and after they read one of two articles about climate change. The articles' wording suggested either low or high uncertainty about climate change.

Busch took the high uncertainty text directly from an earth science textbook published in 2008 in California. For the other reading, she adapted the textbook language to remove uncertainty. For example, she changed "not all scientists agree about the causes of global warming" to "97% of scientists agree about the causes of global warming."

"The cleanup of what I'll call the 'bad text' was actually super slight," Busch said. "It was so slight that I was almost thinking that it wasn't going to have any effect whatsoever. This study showed strategies that are subtly used to cue the reader did have an effect."

Although students in both groups began the experiment with similar average certainty about climate change, students' certainty changed after reading the texts. The survey students took used a four-point scale, with 4 meaning students were "extremely sure" climate change is caused by

people, and 1 meaning they were "not at all sure."

For students who read the text framing climate change as uncertain, certainty decreased from a 2.81 to a 2.67 average on the four-point scale. Meanwhile, students' certainty increased from an average of 2.89 to 3.16 if they read a text that used a more straightforward wording.

Before the study, the students reported that, on average, they were knowledgeable about the causes and effects of climate change, and very sure it was caused by humans. They were also moderately concerned about climate change, and confident they could do something about it. However, Busch saw that knowledge and beliefs of students and of the people in their social circles didn't have a statistically significant impact on how students reacted to the textbook information.

The findings built on a previous study that found language in four sixth grade textbooks adopted in California presented climate change as uncertain in terms of whether it will happen, as well as its human causes. Busch said that there are other signs that climate change topics are absent or mistreated in classrooms. A [report from the National Center for Science Education](#) found 10 states received a grade of D or worse for their standards for climate change education, and that included some of the country's most populous states.

"We chose a sixth grade text for this study, and my son was in sixth grade at that time. This was the [textbook](#) that he had in his science classroom," she said. "Textbooks last in classrooms forever, so it very well could still be in circulation."

But beyond replacing textbooks, Busch said it could be that educators need to teach students about the process and language that scientists use to describe their conclusions to help them evaluate information in real-time, as well as to bolster their ability to critically evaluate information

and misinformation.

"My recommendations for education are teaching more basic skills, including an understanding of how science is done and the language of science and certainty," Busch said. "Science has often been presented as a book of canonical, established fact. We need students, and the general public, to have a stronger understanding of the scientific process."

More research is needed to understand how teens use their outside knowledge, beliefs and the beliefs of their friends and relatives to evaluate climate change information, Busch said. Other studies have found that social norms—such as the beliefs and attitudes of their friends and family members—can be very influential for teens, and can predict how accepting young people are of climate change. It could be that the students in the study saw the survey as a test, and it may not reflect their actual views.

The study, "Textbooks of Doubt, Tested: The Effect of a Denialist Framing on Adolescents' Certainty about Climate Change," was published online Sept. 9, 2021, in *Environmental Education Research*.

**More information:** K.C. Busch, Textbooks of doubt, tested: the effect of a denialist framing on adolescents' certainty about climate change, *Environmental Education Research* (2021). [DOI: 10.1080/13504622.2021.1960954](https://doi.org/10.1080/13504622.2021.1960954)

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