Anti-consensus extremity, understanding, and science literacy (#6968)

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1) Have any data been collected for this study already?
No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?
The key prediction is that the gap between objective and subjective knowledge widens as extremity of anti-scientific consensus beliefs increase. We further predict that as extremity increases, subjective knowledge increases, but objective knowledge, as measured by a battery of scientific literacy questions, decreases. We will test this in two domains: Genetically modified foods and climate change.

3) Describe the key dependent variable(s) specifying how they will be measured.
There are three types of variables:

The first variable is extremity of anti-scientific-consensus belief. For each issue we will measure this using two questions.

For genetically modified foods we will ask people to rate their “level of concern about” and their “level of opposition to” genetically modified foods. These two 7 point scale questions are anchored by “not concerned at all” and “extremely concerned,” and “not opposed at all” and “extremely opposed.”

For climate change we will ask people to rate their “level of concern about” and their “level of belief in” human-caused climate change. These two 7 point scale questions are anchored by “not concerned at all” and “extremely concerned,” and “completely believe” and “completely do not believe.” The concern question for climate change will be reverse coded, as less concern indicates anti-scientific-consensus belief.

We will conduct all analyses separately for each question and after averaging the two questions for each issue. We expect the pattern to be similar across all analyses.

The second variable is scientific literacy. This variable is created through participants answering 15 true-false scientific literacy questions adapted from the National Science Foundation’s Science and Engineering Indicators survey, and the U.S. Environmental and Biotechnology Study. These questions are widely used among scientists and policy analysts to measure science literacy. We measure responses on a 7-point scale anchored by "definitely true" and "definitely false." Participants are given anywhere from -3 to 3 points depending on correctness. For instance, they would receive 3 points for choosing “definitely true,” when the correct answer is “true,” and -3 point when the correct answer is “false.” We will sum points across all questions to measure scientific literacy. For robustness, we will replicate all analyses after binarizing the scale and treating scores of 1 to 3 as correct and scores of 0 to -3 as incorrect.

The third variable is subjective understanding which is adapted from Rozenblit and Keil (2002). Participants are trained on the scale using an example of how a crossbow mechanistically works, and what different levels of understanding (1-7) mean. Participants then indicate their level of understanding (for both genetically modified foods and climate change) by selecting a number from one to seven.

4) How many and which conditions will participants be assigned to?
Two between-subjects conditions: scientific issue: genetically modified foods or climate change.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
The key prediction is that the gap between subjective and objective knowledge increases with extremity of anti-scientific-consensus belief. The first analysis is descriptive. We will calculate average subjective knowledge and average science literacy at each level of anti-scientific-consensus belief.

To test for statistical significance, we will z-score the objective knowledge (science literacy) score and subjective knowledge score for each participant. Then we will subtract the objective score from the subjective score for each participant and run a regression predicting this difference score with extremity of anti-scientific belief. Support for the hypothesis will be provided by a significant effect of extremity, indicating that the difference between subjective and objective knowledge increases with extremity.

We will also conduct follow-up analyses to test the secondary hypotheses that science literacy decreases with extremity and subjective knowledge increases with extremity. We will run regressions separately predicting each type of knowledge with extremity.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
We will exclude participants who fail an attention check question embedded in the scientific literacy questions section, as well as anyone who gives the

exact same answer for every scientific literacy question.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.
We will work with a panel provider to collect 1000 participants (500 for climate change, 500 for genetically modified foods) after exclusions. The sample will be U.S. nationally representative.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
We will also collect the following demographic variables for each participant: age, gender, income, education, political ideology, and political party. We do this for completeness, but don't plan to analyze any of these variables with respect to our hypotheses.

We will also conduct two secondary analyses. First, we expect that the effect of extremity on subjective knowledge and objective knowledge will be nonlinear. Thus, in addition to the linear model described above, we will model the effect of extremity on subjective and objective knowledge with quadratic models.

Second, we will run an interaction model predicting subjective knowledge with objective knowledge (science literacy), extremity of anti-scientific belief and their interaction. This interaction tests whether objective knowledge predicts subjective knowledge differentially at different levels of extremity. Pilot data suggests that, as extremity increases, objective knowledge may become a poorer predictor of subjective knowledge.