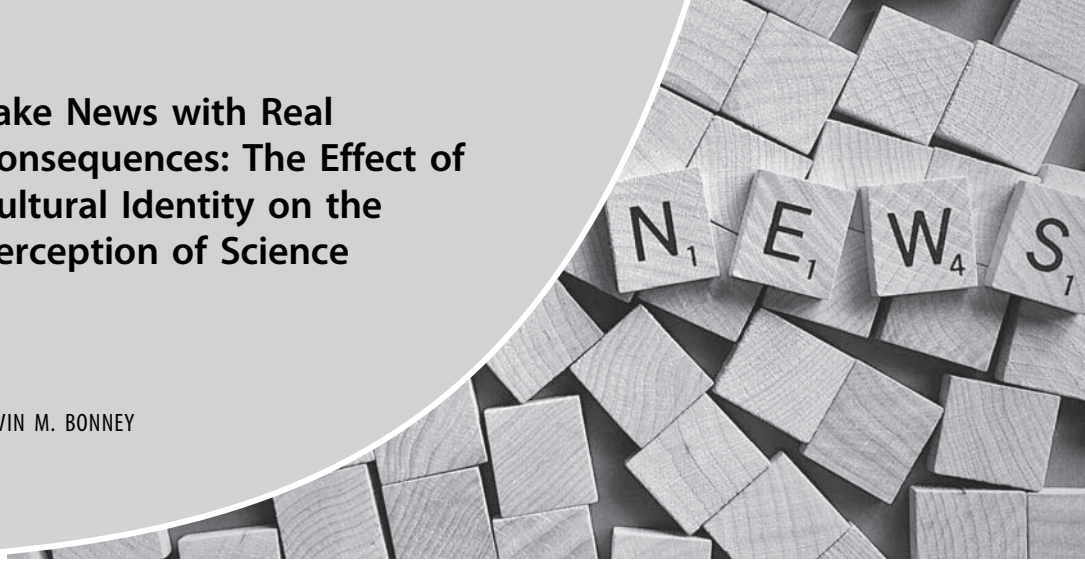
TIPS, TRICKS & TECHNIQUES

Fake News with Real Consequences: The Effect of Cultural Identity on the Perception of Science



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Abstract

Fake news and alternative science are increasingly popular topics of conversation in the public sphere and the classroom due to increasingly far-reaching social media and a shifting political climate. Promoting scientific literacy by providing opportunities for students to evaluate reports of contentious scientific issues and analyze the underlying factors that influence public perception of science is necessary for the development of an informed citizenry. This article describes a three-part learning activity useful for engaging biology students in evaluating the accuracy of science-related news reports, and reflecting upon the ways that social cues, religion, and political ideologies shape perception of science. These activities are appropriate for teaching about climate change, evolution, vaccines, and other important contemporary scientific issues in upper-level high school and undergraduate science courses.

Key Words: *fake news; vaccines; climate change; evolution.*

○ Introduction

Fake news and alternative science are popular contemporary topics of conversation, as evidenced by searching for articles and social media posts about issues such as climate change and evolution. Although they have plagued the body of legitimate science for decades, fake news, alternative science, and other forms of targeted misinformation seemed to have metastasized in the ether of social media and the shifting political and news landscape of recent years. To promote development of an informed citizenry, it is important to use the classroom as a magnifying glass for examining any inaccurate reports of scientific information. The importance of stimulating critical thinking and scientific literacy is illustrated by a 2018 *Science* magazine report that revealed that social media posts containing "fake news" spread much faster than factually accurate stories, and reached ten times as many people (Vosoughi et al., 2018). One reason falsehoods were more popular was that they elicited potent emotional responses involving surprise, fear, and disgust (Vosoughi et al., 2018). When it comes to science, the stream of false and factual information consumed by the public is often filtered by politics, religion, and other non-scientific epistemic belief systems. Many people interpret scientific facts as political constructs rather than objective evidence of testable and verifiable observations (Garrett & Weeks, 2017). Understanding the reasons that a lack of "faith" or "belief" in science persists despite contradictory evidence is important for evaluating and counteracting the influence of fake news and alternative science in public discourse (Garrett & Weeks, 2017).

This article describes a three-part activity I have used in my introductory biology class to engage students in evaluating the accuracy of science-related news reports, and reflecting upon the ways that social cues, religion, and political ideologies shape perception of science. This activity is appropriate for a range of high school and college science courses, and can be applied to a wide array of topics, including climate change, evolution, nanotechnology, vaccines, and the spread of Zika virus (Kahan, 2015a; 2015b; Kahan et al., 2016).

The lens through which this activity examines the influence of social and political identity on the perception of science is the Cultural Cognition Project, run by Dan Kahan at Yale University (culturalcognition.net). The Cultural Cognition Project researches the effect that cultural values, such as those associated with religion and political affiliation, have on risk perception and in influencing public policy. Of particular interest is the finding that public perception of science is greatly distorted by a combination of two factors. The first is a lack of effective science communication, whereby the presentation of robust scientific evidence is insufficient to resolve disputes about scientific claims (Kahan, 2013). The continuing public and political debate over human-made climate change despite an overwhelming and well-publicized consensus among expert scientists is one example of this science communication problem. The second relevant factor identified by Kahan, which he termed "cultural cognition," is the observation that cultural and political identities and values tend to sway the beliefs of individuals about factual matters, despite the existence of contradictory evidence (Kahan, 2013).

The influence of cultural cognition was documented when individuals who represented a wide range of both scientific knowledge

The American Biology Teacher, Vol. 80, No. 9, pp. 686–688, ISSN 0002-7685, electronic ISSN 1938-4211. DOI: https://doi.org/10.1525/abt.2018.80.9.686.

(referred to as "ordinary science intelligence") and political ideology were interviewed about their attitudes toward climate change. First, the ordinary science intelligence survey instrument was developed by modifying the 2014 National Science Foundation Science Indicators to include a broader subject range and validating the instrument on a sample of the U.S. population recruited based on the general population recruitment strategy of the public opinion research firm YouGov, Inc. (Kahan, 2017). Then, participants in a follow-up study were asked if they agree with the factually correct assertion that "There is 'solid evidence' of recent global warming due 'mostly' to 'human activity such as burning fossil fuels" (Kahan, 2015a). The majority of participants who identified as Very Liberal/Strong Democrat correctly agreed with the statement on climate change. As anticipated, the greater their ordinary science intelligence, the more likely they were to demonstrate an understanding of climate science by agreeing with the statement. However, the opposite trend was observed for Very Conservative/Strong Republican participants; the higher their ordinary science intelligence, the less likely they were to hold correct beliefs about climate change (Kahan, 2015a).

A similar connection was observed between religion and evolution. When asked to label the statement "Human beings, as we know them today, developed from earlier species of animals" as true or false, more than half of all people with very low ordinary science intelligence correctly identified the statement as true, regardless of the strength of their religious convictions (Kahan, 2015b). However, when separated into two categories based on self-reported frequency of prayer and importance of church attendance, a positive correlation between science intelligence and reported understanding of evolution was only observed in people scoring less than one standard deviation below the mean ("below average religiosity"), but not in those scoring higher than one standard deviation above the mean ("above average religiosity"). Conversely, understanding of evolution worsened with increased ordinary science intelligence among people with "above average religiously" (Kahan, 2015b). Similar patterns were observed for views about vaccines and other contentious topics (Kahan, 2015a; 2015b). When provided information about the benefits and comparatively low risks of vaccination, perceptions of vaccine risk were greatly skewed by political affiliation and cultural identity (Kahan, 2013). The more information people received about vaccines, the more polarized they became along sociopolitical lines (Kahan, 2013). More recently, cultural cognition was found to affect public risk perceptions about Zika virus and potential associations of the spread of Zika with illegal immigration and climate change (Kahan et al., 2016). The broad relevance of the aforementioned topics suggests cultural cognition is relevant, appropriate, and important to discuss throughout the science curriculum.

○ Activity

In my classes, providing students with a background about cultural cognition has facilitated highly engaging, productive, and energizing discussions about fake news reports and the scientific claims at their core. I have incorporated several iterations of a cultural cognition–based activity into my introductory biology course over the past several years (Table 1). Climate change, evolution, and vaccines are three topics for which I incorporate discussion of cultural cognition.

Table 1. Examining the influence of cultural cognition on the perception of science.

Lecture/Textbook Topic	Activity Readings	Class Activity
Climate Change	Cultural Cognition: Kahan, 2015a News Article/Case Study: Albeck-Ripka, 2018 Stephens, 2017 Will, 2016	After covering climate change in the textbook/lecture and completing the indicated reading about cultural cognition, divide class into two groups to read either the Stephens article or the Will article and prepare a summary or argument to share/debate with other groups. Follow with everyone reading the Albeck-Ripka article, then discussing the role of fake news/alternative science and cultural/political identity in shaping perception of human-made climate change and the scientific concensus about it.
Evolution	Cultural Cognition: Kahan, 2015b News Article/Case Study: Ferguson, 2017 Jensen 2017 Strauss, 2017	After covering evolution in the textbook/lecture and completing the indicated reading about cultural cognition, divide class into three groups to each read one news article about S.B. 55 and prepare a summary or argument to share/debate with other groups. Alternatively, hold full-class debate about the general issue of teaching evolution and creationism in public schools. Follow with whole-class discussion of the role of cultural cognition in shaping each viewpoint and analysis of the meaning of S.B. 55 and the underlying motivation regarding the teaching of evolution and creationism in public schools.
Vaccines	Cultural Cognition: Kahan, 2013 News Article/Case Study: McCoy, 2015 Zavrel & Herreid, 2008	After covering the immune system and vaccinations in the textbook/lecture and completing the indicated reading about cultural cognition, complete the case study by Zavrel & Herreid in groups of two to four: each group completes Part I, then half of the groups complete Part II and the other half complete Part III. This sets students up for a full-class debate about the Texas vaccine mandate. Follow this with discussion of the McCoy article and the role of cultural cognition in shaping perception of vaccine risks.

First, we cover the topic as it is presented in the course textbook and lecture. To inspire our classroom activity, I choose a recent news story and/or case study each semester to illustrate the relationship of fake news and/or "alternative facts" to the topic. For example, I have used opinion pieces from *The New York Times* and *The Washington Post* to represent opposing views on the scientific consensus surrounding the issue of human-made climate change (Table 1). For the topic of evolution, I chose articles written about S.B. 55, a highly contentious bill proposed in South Dakota in 2017 to govern the teaching of scientific topics in public schools (Table 1). And, to illustrate the role of cultural cognition in shaping public opinion and policy regarding vaccines, I selected an article describing a 2015 measles outbreak attributed to anti-vaccine alternative facts, as well as a case study about a government mandate for HPV vaccination of public school children (Table 1). Incidentally, this case study also facilitates an intriguing connection to climate change. This is because Rick Perry, who mandated the HPV vaccine as Governor of Texas, went on to become the United States Secretary of Energy in 2017, and his connections to oil companies in this role raised similar concerns to those voiced over his connections to a pharmaceutical company when he required Texas residents to purchase its vaccine.

The next step is to pair these readings with relevant articles from the Cultural Cognition Project database (culturalcognition.net) (Table 1). After completing all of the background readings, the class engages in a group discussion or debate about the role of cultural cognition in shaping public perception of science. This learning activity is paired with an analytical and/or reflective writing assignment assigned either before or after the class discussion.

The learning objectives of these activities are threefold: (i) to demonstrate knowledge of a scientific concept, (ii) to synthesize and justify an argument about a contentious scientific issue, and (iii) to apply the principles of cultural cognition to evaluate the role of cultural and political identities in shaping perception of science. During evaluation of student writing, it was observed that most students clearly described the scientific concept chosen for their writing, and accurately articulated the role of cultural cognition in shaping public perception of science in a given scenario. However, the extent of these descriptions was mostly limited to a subset of the information provided in course materials, and rarely demonstrated extensive original thought or use of additional sources. Similarly, arguments about contentious issues were generally clear and supported by evidence, but justification was mostly limited to a subset of the points made in the distributed articles, and attempts to rebut relevant counterarguments were rare.

○ Conclusion

Yale University's Cultural Cognition Project provides a collection of useful and freely available readings to promote discussion of cultural cognition, a number of which are referenced in this article. By focusing on recent news stories, the approach described above engages students with investigation of cultural cognition while highlighting the relevance of science to important contemporary issues and to their everyday lives. In practice, these activities have been consistently interesting and engaging for students, as evidenced by enthusiastic participation in class discussions, thorough demonstration of conceptual knowledge in associated writing assignments, and positive comments about these activities in course evaluations. Although the described activities were used only in an undergraduate introductory biology class for non-majors, with a class size of approximately 25 students, this approach can be adapted for a wide range of course types, levels, and sizes.

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