# Better knowledge of evolution leads to greater acceptance of the concept

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Prevailing theories about evolution state that belief in the concept is tied only to a person's politics, religion or both. But according to new research out of the University of Pennsylvania published in *BioScience*, the journal of the American Institute of Biology, whether Americans accept or reject the subject also depends on how well they understand it.

"We find the traditional relationship between your religious beliefs and evolution, and between your political beliefs and evolution, but we also find that those are not the only factors that matter," said Deena Weisberg, a senior fellow in Penn's psychology department in the School of Arts and Sciences. "They do matter, but if you know more about evolutionary theory, if you understand it better, you're more likely to accept it."

That's positive news for educators, said Michael Weisberg, professor and chair of Penn's philosophy department, also in the School of Arts and Sciences. "For controversial topics—evolution, climate change, vaccines—no doubt the controversy is explained in relation to a person's identity. But actual knowledge of the science seems to play a role, and we've documented that here for evolution for the first time in a representative population."

Previous work in this realm typically asked black-and-white questions with just two answer options or tested a non-representative sample such as a group of recruited high-school students. The Penn team thought that nuance would be important in this conversation, so they created a survey about evolutionary concepts like variation and natural selection using carefully selected language.

To measure participants' knowledge about evolution, for example, the researchers employed a National Science Foundation technique that starts questions with phrasing like "according to scientists" or "scientists would think." This, in theory, allows participants to answer based on what they know about a subject rather than what they believe about it.

Then, to assess survey-takers' acceptance of evolution, they asked questions with choices along a spectrum, with one end geared toward creationism, the other toward evolution and several middle-ground alternatives. For instance, a question about the origin of plants and animals stated that they were created by God in their current form; that they developed through natural processes guided by God; that they developed through natural processes set up by God but then continued on their own; or that they developed entirely through natural processes.

"In measuring knowledge of evolution, we tried to offer scenarios. 'There is a population of fish that can eat minnow. The minnows move really fast and are hard to catch. In the next generation, what kind of fish who eat these minnows are more likely to survive?'" said D. Weisberg. "In designing these questionnaires, we think about what sort of assumptions people are going to make, what they're going to be thinking that we may not want them to think about. A lot of the work has been in trying to refine our question-asking methods to get around some of these issues."

M. Weisberg and D. Weisberg then contracted with an organization called YouGov, which runs online surveys. The group polled a sample of 1,100 people demographically representative of the United States, weighted to ensure as close a match as possible. The survey revealed that 26 percent of participants held creationist views, compared to 32 percent who believed in evolution. In addition, 68 percent "failed" the researchers' questionnaire about evolutionary theory, meaning they demonstrated low levels of comprehension about the subject.

With these two data points in hand, the Penn team

tested whether a relationship existed between knowledge and acceptance of evolution. Incorporating in religious beliefs and political leaning, they found statistically significant evidence that how well a participant understood evolution predicted that person's acceptance of it.

"When we talked to people about what they did or didn't accept about evolution, there was such a gigantic range of views," said M. Weisberg. "The crux of this research is that even once you factor in religious and political ideology, some of the variance is explained by knowledge level."

Wording and phraseology also matter greatly, added D. Weisberg.

"It really depends on how you ask the question," she said. "When we put in more options and ask about plants and animals as opposed to humans, we get a very different response from what is commonly reported. It's not particularly surprising but it's good to know, as a consumer of science. You need to look carefully at what people are asking."

The researchers just completed analysis on a second wave of data from the survey. They're also looking into which interventions and media might be most effective in improving education about evolution.

"We're going to get some more nuanced results," said D. Weisberg. "We are by no means done with this investigation."

**More information:** *BioScience* (2017). DOI: 10.1093/biosci/bix161