Interview on Scientific Communication with Experts from FrameWorks

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In a climate of "fake news," knowing and using skills and strategies to communicate scientific facts, issues, and findings is now more important than ever. To learn more about the ins and outs of scientific communication we spoke to two experts – Dr. Nat Kendall-Taylor, CEO of FrameWorks Institute, and Dr. Emilie L'Hôte, a researcher at FrameWorks specializing in the use of metaphor. For readers who are unfamiliar with FrameWorks, it is an independent non-profit known for its research on identifying framing strategies to effectively communicate about social and scientific issues.

Q. Scientific communicators often struggle to combat the spread of misinformation and myths. For example, some parents avoid vaccinations due to a fear that it increases risk for autism, although this link has been debunked. Why are these myths so hard to revise?

A. There is a common belief that the way to combat misinformation and myth is to provide people with more facts, more exact figures, or to explicitly take on and attempt to debunk the misperception. When we know our issue inside out, it can be hard to accept that the problem may not lie in whether or not the public has access to the right information, but whether the information is framed in a way that makes it accessible and gets our ideas across.

One key thing for science communicators to remember is that people never approach a given issue as "blank slates." They rely on a set of implicit, shared understandings and assumptions—what anthropologists call *cultural models*—to guide their thinking. Awareness of which models are active in people's reasoning about a topic like vaccination can help advocates understand why people resist new information in spite of its scientific value, why misconceptions like increased risks for autism endure, and what strategies can help people think about these issues in new and different ways.

At FrameWorks, we argue that answering questions like this (i.e. what is the best way to correct misperceptions or open people up to new ideas) is an empirical pursuit. It requires interdisciplinary research that starts by clearly defining the messages that scientists and experts want to get across. We then investigate the way people think about a topic—their patterns of reasoning, the connections they make to other issues, and the strategies they use to resist new information. We use these findings to design and test new communications strategies that can effectively bridge gaps in understanding between those working on or studying an issue and members of the public. These may include tools like clear explanations of causes and consequences or metaphors, as well as values and messenger choice.

Q. Scientific communicators often must walk a line when attempting to concisely and accurately explain the nuances of scientific uncertainties. What strategies do you recommend for improving communication related to scientific uncertainties?

A. Our objective at FrameWorks is to give people access to new information and perspectives, and open up space for new discussions to happen in the public discourse. We privilege long-term education of the public on these issues over short-term shifts. In any case, advocates should remember that whenever they talk about an issue, they are framing that issue in a particular way—whether they are aware of it or not. The words and the structures they choose will help or hinder the success of their communication efforts.

Speaking about scientific uncertainty, advocates should concentrate on what they know—and not on what they don't. Steer the public's focus away from the uncertainty, which functions as an empty conceptual space that can easily be filled with default unproductive cultural models—including ways that people think about science and scientists. Walk your audiences through the processes that science has uncovered and has provided a better

understanding of. Explain the mechanisms that underlie the issue under discussion – step by step. Clearly connect determinants to outcomes through explanations of causation. We have found that what we call "explanatory chains" can help achieve these goals. An explanatory chain is a clear, concise explanation of the causes and consequences of a problem, including the mechanism by which the causes connect to the consequences. By clarifying causal processes and making them more accessible, explanatory chains empower people to think through an issue and see the kinds of actions that are necessary to address it. Focusing on what you know can foster better understanding and help people think productively about your issue. Focusing on what you know also inoculates your audience from falling back on their existing, and sometimes unproductive, ways of thinking that are activated by discussions of scientific uncertainty.

Q. Effective communication to non-experts often involves the use of analogies or metaphors. Let's talk more about metaphor. What are the ways that metaphor functions in scientific communication?

A. FrameWorks research shows that metaphors can be powerful explanatory devices that allow for deeper and more nuanced thinking and understanding of complex concepts. An "explanatory metaphor" is a simple, concrete, and memorable analogy between something that people understand (the source domain) and something that they struggle to understand (the target domain), that quickly and effectively explains an abstract or complex topic by way of a more concrete and familiar concept. These metaphors empower people to think through an issue and see how to address it more productively. These metaphors are particularly helpful when it comes to science translation, as the issues that science communicators want to get across tend to be complex, abstract, and rather remote from people's everyday experiences.

For instance, in the field of early childhood education, FrameWorks developed the *Brain Architecture* explanatory metaphor to communicate the idea that brains are built over time and that there are critical periods of intense construction activity in the early years. Construction metaphors communicate process (brains are built) and agency or efficacy (building is an active and ongoing process, and there is always room for improvement but that improvement becomes more difficult over time). The metaphor helps people understand that early experiences affect the brain and establish either a sturdy or a fragile foundation for subsequent health, learning, growth, and behavior. The metaphor sets the stage for people to think about the science more effectively. The metaphor is not the message, but it is a channeling device—creating space for people to engage with ideas and content in more productive ways.

This metaphor is particularly effective because it clearly explains how neurological development follows predictable stages. It proves a powerful antidote to people's tendency to systematically "age up" children, as it helps people understand that the construction project starts during the first years of life and that infancy is an especially intense period of neurological development. It also focuses attention on the strength or fragility of the foundation, which shapes subsequent development, learning, and behavioral outcomes. Finally, it communicates that development is an ongoing process that begins before birth and continues into adulthood. As such, it can help dislodge the tendency for people to see development as a process that stops in early childhood—in short, that early matters…but so does later.

Q. What are the limits of metaphor in the context of scientific communication?

A. As with all framing tools and strategies, metaphors can backfire if they are not tested carefully. As mentioned earlier, the source domain determines which aspects of the issue are highlighted and which remain in the background. You also want to make sure that your chosen source domain does not trigger unproductive default understandings that people use to think about your issue or that it does not lead them down a completely different road from the one you were expecting them to take. For instance, relying on natural source domains, such as the sea, to explain how economic processes work is likely to lead people to reason about the economy as a natural and immutable force, when your goal may have been to present it as a system with wide-ranging effects, but one that is amenable to change through design.

At FrameWorks, we think of explanatory metaphors as research-based, empirically tested tools that have been

developed according to a thorough, rigorous scientific protocol. We use both quantitative and qualitative methods to test metaphors, which provide us with a unique combination of perspectives on our research hypotheses. On the quantitative side, we use experimental surveys, which can help demonstrate the magnitude and extent to which exposure to particular frames and metaphors affect the understanding of a given issue or support for solutions. On the qualitative side, one of our approaches is what we call persistence trials, based on established cognitive science techniques. In conversational group settings, participants are asked to think about a particular explanatory metaphor or frame element, and are then asked to communicate with a third party about the issue. By measuring and comparing people's acceptance of and facility with different explanatory metaphors and frame elements—as they try to explain and reason about an issue—we are able to judge the likelihood that particular frames will be absorbed and used when introduced to the wider public.

Q. How can scientists get better at using metaphor as a communication vehicle?

A. By looking at evidence of what does and doesn't work, and by remembering that when it comes to communications, framing and metaphor are not decorative or optional; they are essential components of a communications strategy. If you aren't careful with your frames, people will frame your issue for you, based on the cultural models they rely on to reason about the world.

Scientists can also get better at science communication by remembering that translating science should be higher on their list of priorities than defending it. Another interesting finding from our research, which relates more to values than to metaphor, is that the value of *Scientific Authority* does not have productive effects in moving public thinking. Appeals to *Scientific Authority* make the case that an issue matters because science shows that it does. It positions the issue as a matter of respect for scientific consensus, evidence, and research. In our research about climate change, we have found that appealing to *Scientific Authority* does little to affect attitudes about climate and ocean change or support for solutions. It actually increases people's sense of uncertainty about the issue and leads to more denials of the issue itself. Other values, like *Protection* and *Responsible Management*, prove much more effective in explaining what climate change is "about" and why it matters.

Q. FrameWorks founder and board chair Susan Nall Bales recently issued the challenge to imagine the "transformation that is possible through a two-science approach" to science communication, "one in which a scientific inquiry and a communications inquiry are pursued together." What training or experiences are needed to develop communication inquiry skills so graduate students become not just great scientists but great science communicators?

A. One could imagine including a course on science translation and framing in all graduate curricula. As we teach graduate students to write scientific articles to effectively communicate the results of their research to their peers, we could teach them to effectively communicate with the wider public as well. Graduate students would be better equipped for their future careers if they understood early on that while facts, figures, and a rigorous experimental protocol may win them a paper in a top peer reviewed journal, they will not win the public over. A course on framing and science translation could teach them that facts are never just facts, and that facts alone do not make for an effective framing and communications strategy. And most importantly, training in framing could be helpful in teaching students which tools and strategies are at their disposal for effective science communication, which will be key in long-term societal change. FrameWorks is currently pursuing this very idea in colleges and universities across the country.