Editorial: The Characteristics of a Good Listener

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In a previous editorial, we addressed public mistrust of science and mathematics (Bloom & Quebec Fuentes, 2020a). We argued that this mistrust stems from various sources, including political partisanship, religious conflict, and historical marginalization of various groups as well as a lack of confidence in experts. One way to enhance trust in science and mathematics is for experts to purposefully consider how they convey information to the public (Oreskes, 2014). Oreskes further makes the point that simultaneously everyone (scientists, mathematicians, educators, and lay people alike) needs to be a good listener. We closed the editorial with a mandate for science and mathematics educators to contribute to the efforts in reestablishing trust in science and mathematics by developing good listeners. The rest of the present editorial delves into the characteristics of a good listener.

A good listener needs to have an understanding of the natures of science and mathematics. To trust information conveyed by scientists and mathematicians, the general public needs to have an understanding of the characteristics of science, the scientific process, and mathematical modeling (Bloom & Quebec Fuentes, 2020b). Understanding the tentative, subjective, and communal nature of science as well as the mathematical modeling process provides a foundation for understanding information conveyed by scientists and mathematicians.

A prime example of this need is the public criticism of Dr. Anthony Fauci for his changing recommendations on mask-wearing over the course of the COVID-19 pandemic. Early in the pandemic, when hospitals were experiencing shortages of personal protective equipment (PPE) and when there was little data regarding disease transmission, Fauci advised the public that masks were not necessary. Later, when new evidence revealed that asymptomatic carriers of COVID-19 could indeed spread the disease and in light of a tremendous increase in PPE production, his recommendation changed, advocating for universal mask-wearing to help control disease spread (Sonnemaker, 2021). In an interview with Kara Swisher (2021) on the *New York Times* "Sway" podcast, Fauci defended his evolving recommendations regarding masks indicating that the people who are criticizing him as a 'flip flopper' who is misleading the public actually lack an informed understanding of science; to them he says, "let me give you a flash. That's the way science works. You work with the data you have at the time" (Allen, 2021). He further emphasized that in science, one must be "humble enough and flexible enough to change with the data." If the public had a better understanding of how scientific recommendations continue to change with new data, perhaps they could recognize that the changes reflect a developing understanding of the scientific phenomenon - and perhaps they could *better listen* and learn.

A good listener needs to identify who is an expert. While Dr. Fauci is certainly an expert, one does not have to hold a Ph.D. to be an expert. Each of us may have developed expertise in a particular field, but few, if any, possess expertise in all areas. Nichols (2017) indicates that through metacognition, people are able to evaluate their abilities and identify those areas that they are quite good at and those which require help from others. While I (Mark) have a fairly developed understanding of North Texas wildlife and can identify much of the local flora and fauna, at least to

a family level, I still rely upon field guides and other resources to be sure of my identifications - I am simply not an expert. Far less do I understand what goes on under my car's hood, how my air conditioner properly cools my home, or how the Wifi communicates with all of my family's electronic devices. When these fail to operate properly, I seek the advice of an auto mechanic, an HVAC technician, or an electrician. Nichols (2017) asserts that many "unskilled or incompetent people overestimate their abilities far more than others" because they do not have that critical metacognitive skill to recognize their lack of expertise; thus, they may never seek expert opinions (p. 45). Further, when expert advice does not reflect what they want to hear, Nichols maintains that bad listeners "search for the loopholes in expert knowledge that will allow them to disregard all expert advice they don't like" (p. 23). In contrast, good listeners recognize when they need the help of experts and carefully consider the advice they offer.

A good listener needs to determine whether information conveyed is from credible sources. Over the last 30 years, the number of sources for news and information has increased drastically, paralleled by an increase in political partisanship of sources and false information (Iyengar & Massey, 2019). Even good listeners who recognize their limitations and are willing to listen to the advice of experts can end up with bad information. The Stanford History Education Group (SHEG; 2016) conducted a study of students' civic online reasoning to determine how well young people evaluate the information they access on their smartphones and computers. After analyzing 7,804 student responses, SHEG determined that the vast majority were easily duped into accepting misinformation as fact. In one of the tests, involving high school and college students, the task was to discern that a website they visited presenting information on minimum wage policy was for an organization that was a front group for a D.C. lobbyist and, therefore, presented partisan opinion - only nine percent of the high schoolers and only seven percent of the college students made this discovery (SHEG, 2016). Make no mistake; adults also fall prey to well-disguised misinformation (Gottfried & Grieco, 2018).

The SHEG researchers identified three distinct strategies that separated the discriminating students from the rest - strategies that made them *good listeners* (Wineburg & McGrew, 2016). First, when *good listeners* land on an unfamiliar website, they open a new browser and Google the name of the sponsoring organization or its leaders - an approach the authors refer to as *lateral reading*. Second, *good listeners* do not rely upon the 'About' page on websites, understanding that they cannot determine the validity of a website based upon its own description of itself. Third, *good listeners* scroll through all search results before determining where to click first. Those who are less discerning often assume the order of the results somehow equated to their reliability. With information available in such large quantities and from so many sources, the populace must be critical consumers of information, now more than ever.

A good listener needs to demonstrate healthy skepticism and demand additional information when it is not provided. When I (Sarah) was younger, I overheard my relatives talking about their challenges with the symptoms of menopause and the risks of hormone replacement therapy (HRT). Based on this conversation, I believed that HRT was not a viable option for women. However, the story is more complex. In 2002, the results of a study on HRT indicated that hormonal treatment for menopausal symptoms increased risk of cardiovascular disease and breast cancer. Later studies suggested that the resulting decline in HRT prescription and use (Cagnacci & Venier, 2019) over the subsequent years could have contributed to tens of thousands of premature deaths among women (Sifferlin, 2013). A good listener would have probed a bit deeper before abandoning their medications. While true that the treatment group (those receiving HRT) did show an increased risk of cardiovascular disease and breast cancer, the actual numbers tell a less grim story. Compared to the control group, among the 10,000 women in the treatment group, there were only eight additional strokes, seven additional cardiac events, and eight additional cases of breast cancer (Prescrire Int., 2003). A good listener might have asked questions that would inform her if she was at risk of being one of those additional

cases - questions like 'Do I have a family history of cardiovascular disease or breast cancer?' or 'Do I have any preexisting conditions that increase my susceptibility to cardiovascular disease or breast cancer?' Such questions help good listeners make the most appropriate choices.

A good listener needs to consider how their lived experiences may influence how they interpret information. Iyengar and Massey (2019) argue that the aforementioned changes with news outlets and the political divide overpower scientists and mathematicians attempts at communicating effectively. In contrast, Jamil Zaki, a professor of psychology at Stanford University, explains that empathy is a skill that can be developed to address the "intergroup empathy gap" (Santos, 2020). One strategy for enhancing empathy is to "disagree better" and "cultivate curiosity" by communicating and listening to each other's stories about the origins of one's beliefs (Zaki, n.d.).

An example of such is the ongoing dialogue between Dr. Deb Haarsma, President of BioLogos, and Dr. Hugh Ross, President of Reasons to Believe. According to its website, BioLogos "invites the church and the world to see the harmony between science and biblical faith." The Reasons to Believe website informs that the mission of the organization is to "make every effort to help people discover that sound reason and scientific research consistently affirm the truth of the Bible and of the Good News it reveals." Both leaders are evangelical Christian and both are trained in astrophysics, yet the organizations they lead hold quite distinct views on the origin of species on earth and on how scripture should be interpreted. In *Discussing Origins with Reasons to Believe and BioLogos* (Keathley et al., 2017), each leader describes how their organizations differ. Haarsma describes a key difference as the two groups' approach to biblical inerrancy. According to Haarsma the "tent" of BioLogos,

> includes a range of views on inerrancy. Some actively embrace the term, viewing the Bible as inerrant in matters of faith and practice. Others, while taking Scripture seriously as authoritative and inspired, do not find *inerrant* to be a helpful term in describing their views. (Keathley et al., 2017, p. 13)

By contrast, Ross, emphasizes that Reasons to Believe holds a "strong commitment to biblical inerrancy," and

> den[ies] that Scripture should be required to fit alien preunderstandings inconsistent with itself, such as naturalism, evolutionism, scientism, secular humanism, and relativism. (Keathley et al., 2017, p. 15)

With these two distinct a priori assumptions about biblical inerrancy, each views new scientific claims from completely different perspectives. BioLogos might see new discoveries as informative in adjusting how scripture should be interpreted, while Reasons to Believe will use biblical interpretation to deem the science as credible or not. Despite having such opposing views to how one interprets the same biblical text that they both hold as vital to their faith, Haarsma and Ross, because they are good listeners, maintain dialogue and seek to understand each other. Understanding why each other holds the beliefs they do, and understanding how these beliefs are an outcome of their different lived experiences, allows them to, as Haarsma describes, "celebrate [their] common commitment to biblical Christianity and to science as a means of understanding God's creation" (Keathley et al., 2017, p. 12) rather than focus on what divides them.

Different lived experiences, especially those rooted in religious beliefs such as those of Haarsma and Ross, can have great influence on how individuals interpret, understand, and accept science and mathematics. This last example provides an opportunity to share information about our next issue of *EJRSME*, a special issue with contributions from Sinai and Synapses fellows. The mission of Sinai and Synapses is to "offer people a worldview that is both scientifically grounded

and spiritually uplifting" and to "provide tools and language for learning and living to those who see science as their ally as they pursue personal growth and the repair of our world." The special issue will highlight the work of some of these fellows as they communicate science and mathematics in formal and informal settings to both science and religious audiences. Topics will include climate change education, environmental racism, Judaism's embrace of science, terror management theory, racial equity in science and mathematics, health education during the COVID-19 pandemic, and science and religion as distinct ways of knowing. This special issue will continue the ongoing conversation about effective communication and listening in science and mathematics.

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