

## It's Not What You Know, It's How You Know It

One of the aspects that I enjoy the most about my job as a state representative is meeting new and interesting people. One such individual is my friend, Dr. Nicole Gillespie. Dr. Gillespie is the Executive Director & CEO of the Knowles Teacher Initiative. This organization was founded in 1999 to increase the number of high quality high school math and science teachers with the ultimate goal of improving STEM education in our country. They are working everyday to ensure that we have an ample supply of teachers prepared to help our students meet the challenges that await them in our burgeoning STEM world.

Dr. Gillespie, a Moorestown resident, and I met at one of my Citizens Advisory Panels and hit it off (almost instantly). She is a former Naval officer and former elementary, high school, and college classroom science teacher. She is a highly acclaimed and sought after commentator with regards to developing educators in the STEM field, and she makes a mean batch of ribs!

To learn more about the great work that the Knowles Teacher Initiative is undertaking please visit their [website](#). Now, take it away Nicole!

“Thanks Troy!”

“Every day, if we allow it, we’re flooded with information and have to make

choices about what to take in, what to ignore and what it all means for our families, our communities and ourselves. In addition to the sheer volume of information coming at us, we also have to contend with other people's declarations about truth and "fake news." But we don't have to settle for being passive consumers of information and opinions. Instead, we can all develop our ability to look closely at the reasoning behind the claims we are hearing. Moreover, it's critical for our democracy that we help each other do this on a regular basis.

Here's an example: acorns fall from oak trees, and given the right conditions, will grow into new oak trees. Those are facts. And an oak tree contains much more material (or mass) than the acorn from which it grew, which is also a fact. If you think all the material in the oak tree must have come from the soil, you're in good company. But arriving at that conclusion involved some reasoning on your part, and it's possible that you reached that conclusion without really being aware of your own reasoning. It may seem counterintuitive, but being aware of your own reasoning, including the assumptions you make and the biases you have, is a critical first step for effectively evaluating and dealing with all the information coming at you.

Now, what if I told you that almost all of the mass of an oak tree comes not from the soil, or even from water, but from the air. Would you believe me? Should you?

Maybe knowing that I am a scientist and a former science teacher would be enough to convince you that I'm right. But if you did a little digging (or just asked me), you'd find out that I'm a physicist and don't really have any expertise in oak trees. So the label of "scientist" and "former science teacher" are potentially misleading in this case. Evaluating my claim (that the mass of oak trees comes from the air) based on my characteristics and credentials rather than my reasoning means setting yourself up to be misled. While we can't know everything and need to rely on experts to help us evaluate what we're hearing, we need to be very careful about choosing to believe based on who is saying it (Man or woman? Liberal or conservative? Police officer or defendant?) rather than how they know. As citizens in a democracy, we have both the right and the responsibility to question what experts say. But, and I think more importantly, we also have the responsibility to question our own reasons for doubting or believing them.

So, instead of just believing me (or not) about the oak trees, you could check out

other sources, probably by searching the internet. This is an easy and common way of deciding whether or not something is true. Unfortunately, it's also extremely ineffective. If you already think that I am wrong (or worse), you won't have a hard time finding sources that confirm what you already believe. And you, just like me and everyone else, are primed to search long enough to find something that confirms what you believe and then stop looking.

A better (but definitely more time consuming) strategy is to figure out how I know what I claim to know. If you ask me about the mass of an oak tree, I'll tell you a little about photosynthesis, the process by which plants synthesize food from carbon dioxide and water, and that plants (including oak trees) consist mostly of carbon. I could also tell you that scientists can measure how much carbon dioxide a plant absorbs, and can compare that amount to how much mass a plant gains as it grows. I've never actually done these measurements myself, but I do know something about how scientists work, and how they go about verifying or refuting each other's claims, and I'm convinced that centuries of scientific work confirms the process of photosynthesis. But if you're a little rusty on your biology, and this reasoning just isn't working for you, you still have other options.

For example, you could get familiar with my track record. Do I generally say things that later prove to be right? Even better - what do I do when I'm wrong? Can I admit when I'm wrong, explain how I got there and generally convince you that I won't make that mistake again? These questions will give you a better sense of whether or not to trust what I say than asking which political party I belong to or which news channel I watch.

In my professional life as a science educator, I've heard a lot of people complain about what they learned, or are learning, in school. And I understand; most people will never really need to know the details of photosynthesis, or how to factor a quadratic equation, or the 2nd Law of Thermodynamics. But we do, all of us, need to know how to reason - maybe now more than ever. In my experience, science and math education helps to build critical reasoning skills (about all kinds of issues, not just science and math). That's a big part of why I've devoted my career to those fields, and why I am passionate about supporting teachers to do the same. But all of us, regardless of educational or professional background, are capable of reasoning and therefore capable of thinking critically about the reasoning behind what we read and hear in the news, in social media, from our friends and family etc. While it's easy, and even comforting, to repeat what we

hear without worrying about the reasoning behind it, living in a democracy demands more of us. And when the amount of information coming at all of us is increasing every day, we need to increasingly support each other to do this work instead of tearing each other down.”