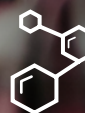


# Scientists as storytellers guide

Expert advice for STEM communicators on how to make science stories more relatable



3M State  
of Science  
Index

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# Introduction

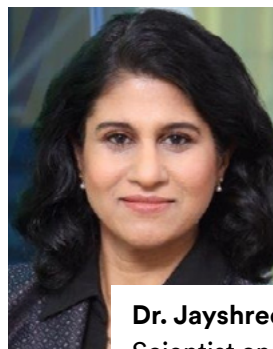
As a global science and innovation company, 3M is very interested in the world's perception of science and its impact on the world around us. To take a pulse on global perceptions, we have conducted an annual independent survey in 14 countries. Shockingly, the 2018 State of Science Index data revealed that almost 40% of those surveyed globally felt that if science didn't exist their lives wouldn't be any different!

The 2019 results have given us a deeper insight into why people may feel this way. 85% of those surveyed say they don't know enough about science, and about the same percentage of respondents wish they knew more. This is very encouraging. However, a clear majority of people, 84%, agree that scientists should help make science more relatable to their everyday lives and talk about it in a way that is easy to understand (88%). It is evident that people want to understand science, but effective science communication is critical.

I grew up in India, a country steeped in oral traditions. Playtime was often exactly that—writing plays and performing the stories. We were all characters. Despite my deep interest in the arts, I grew up in a university town with a premier engineering institute, so you could say my educational path was predetermined. But my professional success, as a chemical engineer and especially as 3M's Chief Science Advocate, can be directly attributed to my ability to communicate effectively and build a narrative. Telling credible stories in a compelling way

makes the facts stick—they inform, and they inspire. Upon seeing the [2019 results of the 3M State of Science Index](#), it is clear that the scientific community needs to do a better job of making science more relatable, a lot of which depends upon how we communicate. Mastering the art of science communication is important not just to garner support for our endeavors, but to ensure we can create excitement for STEM careers in the next generation.

With that in mind, we have put together this guide to help scientists become better communicators—to empower them with the skills and confidence to tell stories on a wider scale. We've included best practices from science communicators and storytelling experts, along with how to apply them to common challenges, as well as examples of how others around the world are addressing similar issues. The variety of perspectives set the stage for truly inclusive storytelling. I hope you enjoy it as much as I have.



**Dr. Jayshree Seth**, 3M Corporate Scientist and Chief Science Advocate

***It is evident that people want to understand science, but effective science communication is critical.***



# The future of inclusive science communications



Margaret Hamburg, M.D.  
Chair, Board of Directors,  
American Association  
for the Advancement  
of Science\*



The scientific community must open our arms and our hearts to everyone, and this can start with what we say and how we say it.

In all communications, we should use an inclusive tone and language to convey clearly that we aim to solve problems in order to help all people, regardless of background. As scientists, we could do a much better job of asking questions and listening to people's concerns, values, and needs. We don't have all the answers, and certainly cannot begin to solve pressing issues without better understanding societal needs and limitations.

## Rethinking existing power structures

During the last year, many people and institutions in the US and around the world have participated in a hard-won dialogue on gender and diversity. This conversation is fundamentally reshaping society and forcing institutions to respond to and confront these challenges head-on.

The scientific community and our institutions are not immune. We must recognize that certain groups are, and have always been, disenfranchised in ways that are not only harmful to overall well-being, but prevent people from fulfilling their potential. This affects how science is done and who it benefits. It's no longer enough to be concerned—it's time to fix it.

## Communicating change in higher ed

At AAAS, we are working with colleges and universities to facilitate true institutional transformation in support of diversity and inclusion. Our [SEA Change](#) initiative is helping to ensure that the full range of talent can be recruited, retained, and advanced in STEM fields. Modeled after a successful program in the UK, AAAS is working with institutions of higher education to incentivize and guide the structural reforms needed to support diversity, equity, and inclusion. We expect to improve outcomes and opportunities for underrepresented groups in science, and establish a clear process for monitoring and accountability.

It's important to keep pushing—and there is much that can and should be done—to force individuals and institutions at every level to reflect on how they contribute to, or potentially detract from, the inclusion of all learners and contributors.

## What you can do

Communicating clearly and with intention brings value to you, your organization, and the people with whom you interact. [The AAAS Center for Public Engagement with Science and Technology](#) provides workshops, resources, professional development, and recognition for scientists who seek opportunities to actively participate in public engagement and science communication.

\* Photo Credit: Robb Cohen Photography and Video

# Telling stories in 5 captivating ways

A well-told story can be extremely powerful —it captures attention, inspires others, and can even lead to action. Read how these celebrated communicators tell scientific stories and consider the ways in which these recommendations could be helpful for your audience.

# 1. Put a human face on what you do

**Katie Couric**  
Journalist and author



Bits and bytes. Speeds and feeds. Balance sheets and bottom lines.

Data and metrics can help illustrate a point, or prove why a story is important to a reader or viewer.

But numbers alone don't make people laugh or cry. People do.

Human emotion brings a story to life, and puts it into terms that anyone can appreciate or understand. To make a story resonate, you need to create a connection with your audience. For instance, I like to frame important issues, such as lifesaving breakthroughs in the field of cancer research, with either the scientists I consider to be everyday heroes or the patients who are being helped. Real stories about real people—their hopes and dreams, fears and frustrations—create an emotional bond with viewers who then feel invested in the situations and the outcomes. In other words, they care. And if they don't care, they won't be interested in learning more.

Far too often, the technical stories told by scientists make perfect sense in their own circles, but to others they can sound like a foreign language. A technical story needs to have an emotional center that taps into the head and even more so, the heart. My advice—after decades of telling stories to everyday Americans—is to find the human connection and highlight our shared experiences. Then watch how those stories make people think... and feel.

Nearly 20 years after [TODAY televised my colonoscopy](#), I continue to hear from people who, after watching, were motivated to get screened for colon cancer. Viewers understood how important it was because they were familiar with my personal experience. They knew that my husband Jay had died of colon cancer at 42, leaving me a widow and my daughters—who were six and two at the time—fatherless. My pleas for regular screenings might not have been as effective if I'd merely shared facts

and stats or recommended screening techniques and guidelines. By demystifying a procedure that can save lives and implicitly keep families intact, it helped people not only understand the basic biology of colons and polyps, but also how preventative measures can stop cancer in its tracks, or help avoid it altogether.

Every day, the scientific community makes discoveries and advancements that people need to understand and apply to their own lives. Here are some recent examples of scientific developments that are changing the lives of people every day. Think what this information could mean to a friend, family member, or stranger in need—and how the real-life examples might help inspire and inform others:

- Jeff Marquis, an athlete who's been paralyzed for seven years, can walk again after being given an experimental treatment that [allows his legs to communicate with his brain](#). He no longer needs daily help at home and can walk the length of four football fields without resting.
- The “Survivors Teaching Students” program brings patients and caregivers together with oncologists-in-training. By [putting a face to ovarian cancer](#) and making doctors more aware of symptoms and the emotional needs of patients and their loved ones, they become more informed and compassionate medical professionals.
- Around the world, there are many students who aren't exposed to consistent, high-quality STEM education in or outside of the classroom. The [“Skype a Scientist”](#) initiative allows teachers with limited resources to bridge those gaps by welcoming an inspiring scientific mentor into their classroom, simply by leveraging free video-conferencing software.

A good friend of mine uses a mobile app that notifies her when her husband, who is diabetic, has a drop in his blood sugar level. Knowing the peace of mind this technology has afforded her makes me more interested in and optimistic about the field of digital healthcare.

***So, the next time you're asked to talk about your scientific work, think first about how it affects people, and how they might experience what you do in real life.***

Then, watch as your scientific story excites, inspires and moves them in a way only another human can.

## 2. Create dramatic tension

### Captain Scott Kelly Retired NASA Astronaut



I had zero chance of becoming an astronaut. Nada. Well, the teenage version of me didn't. I didn't pay attention in school, and I hated homework. Not the normal pathway to a career in space.

Back in high school, no one would have thought I could become an engineer, Navy fighter pilot, astronaut and commander of the International Space Station.

But I achieved all of that—one homework assignment, test, and day at a time. It all started by reading an amazing book that changed my life.

If that anecdote caught your attention, you can see how dramatic tension is critical to good storytelling. By setting the scene with challenges, setbacks and obstacles—and then revealing how you faced and overcame them—you'll draw readers or listeners into your story.

You might even captivate them enough to motivate a change in perception, belief or action.

Scientists don't have to write a Shakespearean sonnet or a Hemingway novel to inspire others. You are in control of your powerful story.

However, reaching audiences unfamiliar with or uninterested in your work can be daunting. Sure, you're used to communicating with other scientists using highly technical language. That's best for research papers, journal articles, and fellow STEM colleagues.

But it won't reach students or others lacking background on the topic. Jargon won't win them over; it will turn them off.

Everybody loves a good story. **And the best stories start with a challenge, followed by a journey** – the ups and downs, stops and starts – that leads to meeting that challenge head on. Create dramatic tension, and you'll have them hooked.

Still curious about the book that changed my life? It was *The Right Stuff* by Tom Wolfe.



## 3. Connect with your audience

### Alan Alda

Actor and founder, The Alda Center for Communicating Science



“What are you up to?” she asked.

I was at a dinner party next to a woman I’d never met. She probably expected a tedious business tale, but I said, “I just heard this extraordinary story from a young doctor. How he watched an older physician tell a patient her cancer had metastasized and that she didn’t have long to live—and the patient didn’t react and didn’t ask questions, so the doctor, figuring he’d accomplished what he came in for, left the room.”

The woman next to me sat up. “He just left?”

“But the young doctor had been trained to pick up cues from patients, and he was sure this patient hadn’t understood. He sat down facing her and took her hands in his. He didn’t use words like ‘metastasis.’ He spoke simply, and gently, looking her in the eye. After a minute, he saw a tear roll down her cheek and she asked her first question. He had helped her face death with human contact.”

“They should all be trained like that,” my dinner partner said.

“We’re trying,” I said. “So far, my team has trained 15,000 scientists and doctors how to communicate.”

“Wow,” she said.

Except that she didn’t say “wow,” and I hadn’t actually told her that story. Many times since, I’ve wished I had. When she asked me what I was up to, all I gave her were facts: “I helped start the Alda Center for Communicating Science, and we train scientists and doctors to communicate better.” Not so good. Her eyes went to half-mast.

Somehow, I had forgotten to use the most fundamental thing we teach. Empathy. What is the other person going through when we try to communicate? What do they care about? Do they understand the words we’re using?

**The answers are all there in their faces.** And even when we communicate through a piece of writing, we can imagine what they’re going through as they read it. The most informative statement isn’t communication. Communication is when it lands in the other person’s head and sticks there.

It’s a story that’s stuck in my own head ever since.



## 4. Be concise and use meaningful details

**Gitanjali Rao, 2017 national winner, Discovery Education 3M Young Scientist Challenge**

While explaining new solutions to common challenges, it's important to keep the following in mind: have a clear vision of the problems you're solving, the ideas you're developing, and how they differ from what's come before.

Of course, when you're talking about your thought process you want to share all the details of how you tackled the problem. **But it's important not to overwhelm your audience with technical data.** Keep your stories concise and be sure to use visuals to enhance your storytelling. Models, drawings, or animated diagrams allow you to convey detail without confusing your audience with too much scientific jargon.



## 5. Give an authentic delivery

**Astronaut Abby**  
Executive Director,  
The Mars Generation

When you're passionate about a topic, it's natural to want others to share your same excitement in-person. But it's vital to keep in mind that **how you tell your story is just as important as what you say.** I've found some qualities are constant regardless of situation, such as: modulating your voice for emphasis, speaking with enthusiasm, and using neutral body language. Together, these keep listeners focused on what you're saying and bring them into your world.

Over my years of public speaking, I learned that authentic delivery is a universal concept. Whether I am speaking to a kindergarten class or an auditorium filled with professionals, these verbal and non-verbal techniques create a base that I can build upon and personalize for any audience. And remember: practice makes perfect.

# Top 4 science communications challenges

Now that we've grounded ourselves in the elements of a captivating story, we're going to apply them to common scenarios you're likely encounter on a regular basis. If you've ever asked yourself how you can get a non-scientific audience to understand what it is you do, look no further. Discover how you can address each scenario and then put everything into practice.



**Elizabeth Bojsza,**  
M.F.A., Assistant  
Professor of Practice,  
Improv Lead



**Radha Ganesan,**  
Ph.D, Assistant  
Professor of Practice,  
Message Design Lead



**Dr. Jayshree Seth,**  
3M Corporate  
Scientist and Chief  
Science Advocate

[Alan Alda Center for Communicating Science, Stony Brook University](#)

## 1. How can I get people to see science and care about the impact it has in their daily lives?

### Answer:

First of all, get specific about these “people” with whom you want to communicate. There is no monolithic “general public,” rather there are distinct groups of people and individuals who have a range of prior knowledge, interests, values, and opinions. Consider the contrast between the following hypothetical audiences:

- Non-science professionals at a conference
- Families who are visiting a science festival
- Your relatives at a holiday dinner

These audiences could all be told the same story, but they’ll take different things away from it. In order to truly engage them, you’ll need to tailor how you tell your story to what each group cares about. If you really want to change someone’s perception of science and its relevance, recognize that it is a time- and effort-intensive exercise that might not be achieved through a single interaction. And it starts with listening.

This is perhaps the moment when those of you who are working on basic research feel at a disadvantage. Applied research is by its nature relevant to people’s lives, whether it be in the

immediate or distant future, but we don’t yet know what we will discover through basic research. If this is you, consider having an example ready for how a discovery led to practical applications in a field close to your own, and lean in to the human pursuit of knowledge and the drive we have to uncover the mysteries of our world.

If you can connect with your audience as fellow humans first, then they will be more open to what you are trying to say. Listen deeply to your audience about the feelings they hold about science and their own experience of it to date. Are there any questions that they have always wanted to ask?

Check your own judgments about their questions as well. Do you see their opposition to something that you think is science-based as them opposing science itself? And share your motivation—what was it that you got excited about science when you were younger? Passion and excitement can be contagious—share yours!

### Action:



***Remember to put a human face on what you do and lead with the impact. You can talk about why it matters to you, which is helpful, and you can work to figure out why your story and science would matter to them.***

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**Radha Ganesan,**  
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## 2. How can I simplify complex subjects without losing the original meaning?

### Answer:

Worry over “dumbing it down” is something we hear frequently from the scientists we train. It can be a challenge to tell a concise, compelling story about something that we experienced or something we know a lot about. Science is full of detail and nuance, and we often want to share every detail in order to tell the truest picture possible. However, there is an issue with this: your audience won’t be able to follow your story if you don’t distill some of the details. Stories are not reports, they are journeys. In our eagerness to share the subtleties of our work we sometimes fail to show the forest for the trees. Not every detail helps move a story forward or makes your point any better; oftentimes less is more.

In telling the story of how Penicillin was discovered, describing Sir Alexander Fleming’s workspace as a “basement laboratory” is evocative and efficient. That simple description gives us a lot more than a bunch of detail would.

Additionally, some words, even though they are the most specific to your field, are not accessible to people who do not share your expertise. Jargon can become somewhat invisible if the word is in normal use for you.

Keep your focus on your audience. You will know when you’ve slipped into jargon—they’ll show it on their faces.

### Watch out for jargon

#### Type of jargon

Field-specific words

#### Example

Slewing correction

#### Description

Most scientists know that this term refers to the adjustment you need to make because time is affected by the size of a signal, but people outside of experimental physics are not likely to know this. The term is really useful to those in fields where this calculation is needed, and would rarely be encountered elsewhere.

#### Type of jargon

Acronyms

#### Example

AI

#### Description

“AI” means artificial intelligence to a lot of people, and for those involved in fertility treatment, it may mean “artificial insemination.” Other acronyms cannot be deciphered at all and remain a puzzle to your audience.

#### Type of jargon

Hidden jargon

#### Example

Basic research

#### Description

Separately, these words are fairly common, but together the concept of basic research is not transparent to people who aren’t exposed to researchers and funding.



### Action:

***Don’t be afraid to reduce detail in favor of telling a compelling story. Use metaphors and analogies that are accessible to your audience and find smart shortcuts to getting to your point.***

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### 3. How do I sustain my audience's interest?

#### Answer:

The ways to keep your audience engaged fall into two broad categories: WHAT you are saying and HOW you are saying it.

In terms of content, think about what you can do to create a “word picture” for your audience. Use vivid, sensory language to activate the imaginations of your listeners. If possible, put yourself in your story. A first-hand account (where you use “I” and “we”) can be more engaging than a third-person account (where we hear about “them” or “she” or “he”).


There is a question your audience is dying to know the answer to and you should tell them—but only at the end of your story (or very near it)! For example, if you are telling a story where you are the main character, think about how you can share moments where you confronted challenges (or dramatic tension) in your work—these obstacles could be external, such as a race to publish ahead of another team of researchers, or internal, such as having to let go of one career path to pursue another opportunity. The bigger the obstacle to overcome, the more your audience will lean in and listen to your story.

In terms of delivery, use your voice as auditory “punctuation” to how you tell your story. In the spoken word, we don’t have commas, parentheses, or exclamation points but we *do* have the controls of our voice: volume, rate, and pitch. Consider the following:

- How a pause can create anticipation
- How a rise in pitch accompanied by an expressive gesture might help your audience feel what you were feeling at a point in the story

The musicality of language also contains meaning for our audience, and dynamic delivery leads to increased engagement from your audience.

#### Action:

 ***Both your content and your authentic delivery can help sustain your audience's interest. Be vivid, clear, personal, and dynamic in your delivery. Stay flexible and connected so that you can get the signals your audience is sending and adjust your story.***

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## 4. How can I explain my latest project to others outside my team if it's proprietary?

### Answer:

This is one of the most common communications challenges I've faced while working on some incredible projects. However, the solution to this issue is much simpler than you might think.

If the specific scientific project you are working on is proprietary and *you are able to share the problem* to be solved, focus on describing the problem and why it's important to find a solution. In other words, lead with the impact. How do you define the problem in daily lives? What are some existing solutions and why are they not ideal? What avenues are you looking at to creatively address the problem? Your audience might even encounter this problem regularly, and adding context helps them understand why it matters.

If you *cannot talk about the specific problem itself*, discuss it in more generic terms. Draw parallels where you can. For instance, if you are working on making a sticky tape glow in the dark, relate it to an

everyday scenario such as how it could be used on diapers to help parents change their infants in the middle of the night. This allows you to communicate the problem you are solving at a high level without providing details on the specific problem and the exact solution. Painting a picture for your audience helps them visualize and empathize with the situation.

### Action:



***As scientists, we frequently work on high-profile projects that need to fly under the radar due to legal obligations. But do not let that prevent you from framing the impact of your work. As you think about the story you want to tell, here are a few recommendations to help you prepare:***

- ***What is the specific problem you are trying to solve? Regardless of if you can speak about it in specific or general terms, ask yourself, "How can I make it personally relevant to my audience?"***
- ***What is the key takeaway? Once you set the stage for the solution, challenge yourself to lead with the main benefit and impact the solution will have on that audience.***

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This answer and action were authored by

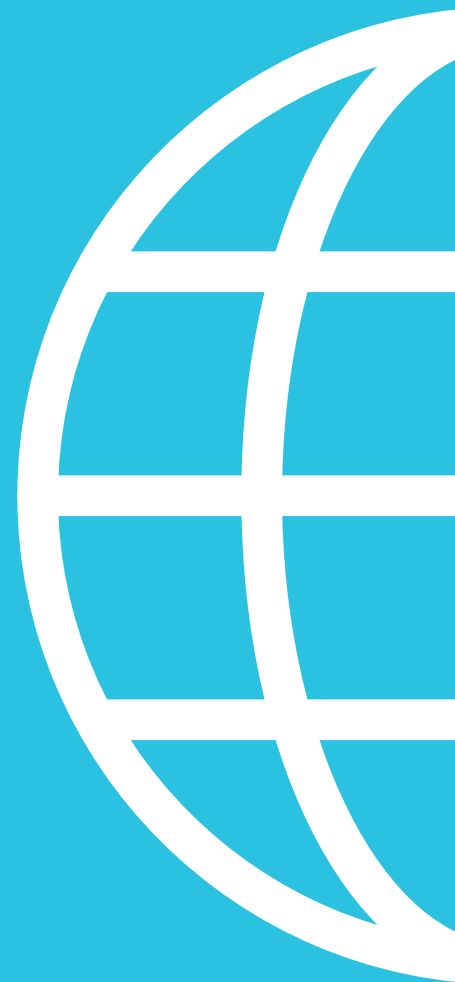
**Dr. Jayshree Seth,**  
3M Corporate Scientist and  
Chief Science Advocate

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# How the world is making science more relatable

Effective science communication isn't only limited to the US—it's a global challenge.

We asked international experts in some of the countries we surveyed how they're taking action to make science relevant to more people. Let's take a trip around the world to see how people are tackling this challenge.



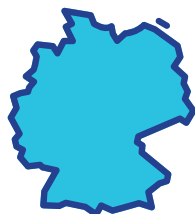


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**Emelie Fritz**

Senior Product Development Engineer, Electronics Materials Solutions Division & Automotive Electrification, 3M



## Germany

For me, science is about curiosity, connecting the dots, and collaboration. It's not just the traditional learning and “by-the-book” experiments many associate with the field. I try to promote this in whatever I do—in my private life or as a product developer for the automotive electrification market. When I tell science stories, I go beyond what the challenge is to **inspire people, make the topic relevant, and ask for their support.**



**Christoph Schuell**

Product Development Specialist, Medical Solutions Division, Health Care Business Group, 3M

When asked about my job as a scientist by colleagues, friends, and family I try to **highlight how science impacts everyone in their everyday life.** Science is all around us in areas we encounter daily: food, energy, infrastructure, automotive, and much more. For instance, I work in 3M's healthcare business group to develop medical devices. These crucial pieces of technology could have a massive impact on the millions of patients in hospitals and clinics everyday.

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**Dr. Lim Tit Meng**

Chief Executive, Science Centre Singapore



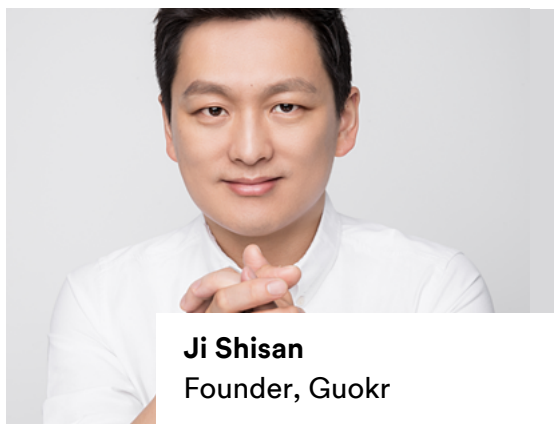
## Singapore

Science is all around us. One effective way to make communication more relatable is to **bring out its relevance, beauty and significance through dramatic stories.** These tales of trial and error and sheer determination to seek the explanation behind the unknown are inspiring to audiences.

Science is often about observable phenomena, so stories should also be told with the help of images to make abstract concepts tangible. This allows us to illustrate how our observations and experiments led to new knowledge.

“

“



**Ji Shisan**  
Founder, Guokr



## China

At Guokr—an online Chinese science and technology website—our audience helps shape the topics and stories we choose to publish. To understand their perspective on science-related issues, **we embrace their feedback and immerse ourselves in their conversations.**

We found the the secret ingredient for engaging our audience: real-life connection. Our team portrays scientific topics as a natural part of daily life. As a result, it makes the scientists behind those innovations seem more relatable.

“



**Alan Barker**  
Independent Consultant,  
Kairos Training, Ltd.



## UK

Science becomes relatable when information has meaning. Humans create meaning using their imaginations to invoke the “wow” factor. A spectacular demonstration, a vivid metaphor, or a mind-blowing statistic, make us see things differently.

You can also create a mystery by finding the intrigue to hook your audience’s attention. For instance, is there a seemingly unsolvable problem, evidence that doesn’t make sense, or a mismatch between theory and findings?

**But one of the most important ways to reach audiences is to construct a narrative.** That might include arousing curiosity, building suspense, and fulfilling readers’ expectations. In my experience, every sci-comm presentation finds its own structure. However, every structure iterates that exact narrative arc at least once.

“

# Make your stories stick

Stories stick. As scientists, we need to better incorporate elements of storytelling into communications to foster engagement with—and appreciation of—science. We hope that the best practices and recommendations help make communicating the value of science to the world a less daunting task. How we educate the world about the problems we solve will be much more vibrant with these expert resources at your fingertips.

I have seen the power of science communication first-hand with my own children. For instance, with my son, the key is finding a way to creatively communicate the concept, or “the what.” With my daughter, she is most drawn in by the context, or “the why.” Knowing my audience—regardless of age and experience—helps me lead with the aspect of my story that will best capture their attention. By communicating effectively, we can not only earn more support for scientific pursuits but also appeal to a wider population. At the end of the day it’s a win-win.

*Happy Storytelling,  
Dr. Jayshree Seth*



Read the [2019 3M State of Science Index results](#) and connect with me

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