Tips on communicating research to a broad audience

Compiled by Claudia Bode, Education Director at the University of Kansas Center for Environmentally Beneficial Catalysis with advice from Roger Martin, science commentator from Kansas Public Radio, and Dick Schowen, Professor Emeritus, Dept. of Chemistry, KU

"One hallmark of intellect is the ability to simplify, to make the complex easy to understand. Anyone can be unclear." -Paula LaRocque, former writing coach, *Dallas Morning News*

Why is it important to communicate to the public about your research? 3 reasons:

1. **Educate the public (build public support)**
   The public has a lot to learn about science. They need folks like you to teach them more, so that they can make informed decisions.
   An NSF survey taken a few years ago tested the public's knowledge about basic science facts. What percentage of the public thought dinosaurs and humans lived on earth at the same time? 50% [dinosaurs lived 230 mya; earliest humans ~160,000 yrs ago].
   What percentage could define DNA? 30%
   What percentage could tell you what a molecule is? 13%
   Also, everything that you can do to make your ventures lucid, interesting, relevant and captivating is important to a public engagement with science, and that is the foundation of long-term public support.

2. **Turn kids onto science (help U.S. stay competitive):** Fewer U.S. students choosing doctorates in STEM, Economic well-being depends on technological advances; This will help the U.S. stay globally competitive.

3. **Gain the favor of NSF, NIH** (or naked self-interest)**:** "*The Project Summary must contain a summary of the proposed activity* ***suitable for dissemination to the public****… It should be informative and…understandable to a scientifically or technically literate lay reader*."

Some areas harder than others to communicate

If you have ever tried to communicate to lay audiences about your research, I suspect that many of you have experienced failure – in other words, glazed eyes, attempts to change the subject. It can be extremely difficult. Granted, some areas are easier than others – for example, butterflies. Everyone loves butterflies. Life sciences are easier than physical sciences. Engineering is easier than math. Computer models, possibly the worst. The more abstract your topic is, the harder it is to describe. But, there are a few simple strategies that you can learn that will help you improve your communication skills.

What are the keys to effective communication?

Know your audience! If it's a general science audience, assume freshman level.

Remember, there are those in the audience who don't really want to be there. Make it engaging.

Don't be afraid to make bold statements about your research – be sure to say "this is the first-ever…" whatever (if it is) to make sure the audience gets the significance.

Top 10 Communication Strategies

(content adapted from: http://www.ucsusa.org/ssi/resources/how-scientists-can-work.html)

1. Simple, not simplistic

Use common words – cell death instead of apoptosis. Be concise. If you say, for example, that a symbiodinium is a unicellular dinoflaggelate one time and a single-celled algae another, people will get confused. Just call it a single-celled algae every damn time.

Think about your answer in advance. Once, I asked an ecologist to explain her work using GPS to look at plant biodiversity. She started off by saying, "Well, everyone knows that maps are sexy…" This was not a good opening remark because most would disagree with this statement and not relate.

Public audiences aren't dumb, they just don't know the same things that you do. Encourage your audience to interrupt you if they don't understand.

It's ok, and helpful, to repeat yourself. Use short sentences.

2. Put in context

Put the science in context. Pull the camera back

Instead of saying my work focuses on "carbon dioxide catalyzed activation of C-O bonds"…

Say, "I'm developing an inexpensive, environmentally friendly approach for making pharmaceuticals."

3. Focused

The core message is what you want someone to remember when your gone. Figure out what the core message is, and say that and only that. Too many details make things confusing.

4. Use vivid language

Create word pictures to make visible the invisible realms in your work. Find one visual image that captures your work, then use it… Some examples:

Graphene is a razor-thin sheet that resembles chicken wire.

A hot commodity known as butanediol needs a makeover. This clear, syrupy liquid may look nice enough, but it has an ugly side.

From Krulwich Wonders: Once again, the subject is carbon. So far we've been celebrating carbon's ability to bond with other atoms. Today we get violent — and break those bonds. When you eat a carrot, set fire to a piece of paper, or put a match to a lump of coal, carbon atoms are being yanked, juggled and ripped out of each other's embrace. People have gotten very good at breaking carbon bonds: that's how we light our cities, drive our cars, power our tools. But let's look at this from carbon's point of view...

5. Use Metaphors/Analogies to emphasize your point.

Ex. metaphors: fuel to the fire, recipe for disaster, difficult to swallow, food for thought, addicted to oil, time is money.

Ex analogies – my research is like fishing with a net – I'm trying to design a net with really small holes so that I can catch more fish.

6. Tell a story

The problem-solution structure is a good one. Talk about how you're overcoming a formidable challenge, solved a long-standing puzzle, or how you attacked a problem in an innovative way.

The chronological approach is not.

Think of your audience. Imagine an audience that has a hard time keeping up with you!

7. Be Unexpected

Unexpected – surprise gets people's interest. For example, when Art Silverman needed to get people to understand that there are 37 grams of saturated fat in medium-size popcorn. So he said, "a medium-sized butter popcorn contains

more artery-clogging fat than a bacon and eggs breakfast, a Big Mac and fries at lunch, and steak dinner with all the trimmings – combined!

From Krulwich Wonders: [How many colors do we see?]....Sparrows see even more colors than we do, butterflies still more, which got us wondering: Is there a world champion? Is there an animal that sees more colors than any other creature on Earth? It turns out, there is. It's a shrimp. Not an eagle. Not a falcon. A shrimp. That just doesn't seem right. Why would an animal that lives *underwater and doesn't even gaze at the sky,* why would it have the best color sense? We never found a good answer to that one, but we stopped caring once we met the shrimp. Mantis shrimps — that's what they're called — are staggeringly odd to look at, wonderfully fun to sing about (which we did), <u>but no one, and I mean no one</u>, has loved this shrimp better than Matthew Inman.

8. Emotional – Make people care

Make stories personally relevant…or emotionally tangible.

Don Steeples. When I asked him if he had any advice for me about the workshop, he proceeded to tell me about one of his encounters with a journalist from the KC Star back in the late 1970's. He had been researching sink holes in western Kansas for the KS Dept. of Health and the Environment. After spending a long time explaining the technical details of his report, the journalist finally said, "so what does this mean?" Don unwittingly replied, for better or worse, "the earth is not going to open up and swallow a bus load of nuns." Sure enough, the next day's headline read "I-70 sink hole not likely to swallow a bus load of nuns!"

9. Put numbers in context

To make polyester you need terephthalic acid (TPA). In 2006, around 60 billion pounds of TPA were made worldwide. That's the same weight as 82 Empire State buildings! Or, we make 4 billion pounds of ethylene oxide each year, that's the same weight as 98,000 statue of liberties.

This process releases 3.4 million metric tons of CO_2 each year (equivalent to the pollution from 900,000 cars)

10. Answer: "So What?"

What is the mystery you're trying to solve, where's the excitement? Find words and images to convey this higher mission. Find the area of overlap between personal motivation and social good. Start wide – show where your work lies in the map of human knowledge.

Practice using these strategies to explain your research to a non-technical audience.

Why is your research important?

What problem does it address?

So what? Why should I care?

Notes from Dick Schowen for scholars giving a lecture to a general, public audience

KU Postdoctoral Association, Parlor ABC, Kansas Union, Fri 26 Apr 2013, 12-1pm

1. Do not get into the details: if you are a chemist, never show a chemical structure; if you are a biologist, never show a gel; if you are a physicist, never show an equation (possibly $E=mc^2$).

2. Do not try to give a minicourse in either your general field (psychology, say), your sub-field (solid-state physics), much less your niche (anti-parasitic drug design).

3. Do not define a list of technical terms at the beginning and then later use them freely on the assumption that the audience will remember what you said.

4. Ideally both your closest scientific colleagues and the general audience will understand and enjoy what you say but sacrifice the close colleagues readily if necessary.

5. Do not explain how difficult the work you do is. Nobody cares (sorry).

6. Do not run through what a typical day in the lab is like. Nobody cares (sorry).

7. Do not be modest about the most general kinds of significance of your work, while remaining more or less honest.

8. Show pictures of instruments only if they (the pictures) move your story along – and only explain how the machine works if it takes no longer than 10 sec.

9. It is fine to use humor IF it is actually funny (if your friends never laugh at your most hilarious remarks, that may suggest an approach other than comedy). The humor should be truly relevant and not involve you in lengthy explanations of why it is funny.

10. Plan a general talk far more carefully than you would a technical talk.

11. Never use slides from a technical talk on the assumption you can easily make clear what they mean.

12. Never show a slide of which you have say, "I know you can't read this [or see the details, etc.]. How hard can it be to make it legible?

13. Never show tables of numbers and say, "It would take hours to explain this, but this in fact shows my thesis is correct." In fact, try not to show tables of numbers.

14. Of course you have to simplify, but use analogies only if the audience is not going to find them harder to understand than the situation you're trying to explain. (A circuit diagram illustrating electrical feedback to explain feedback inhibition in a metabolic pathway should only be used if the entire audience belongs to the Institute of Electrical and Electronics Engineers.)

15. Unless your audience are small children, they are likely to be able to understand the simple logic that leads from your observations to your conclusion, and will enjoy making that connection if you give them the opportunity.