Brown University Science Center's

Quick Guide to Science Communication

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Getting Started

Effective science communicators educate non-specialist audiences about scientific topics, issues, and debates in ways that are informative, accessible, and empowering. Before embarking on a science communication project, science communicators should be able to answer the following questions:

- Who is my **audience**?
- What is my **message** for my audience?
- What **medium** am I going to use to communicate my message to my audience?

Brown University Science Center's *Quick Guide to Science Communication* offers detailed guidance on how to answer these questions and how to communicate successfully with a wide range of audiences about science.

Know Your Audience

Knowing your audience is key to communicating successfully about scientific topics. Common target audiences include the lay public, the media, and policy makers. As you prepare your article, presentation, visuals etc., keep your intended audience in mind.

For more information about communicating with the **lay public**, click **here**.

For more information about communicating with the **media**, click **here**.

For more information about communicating with **policy makers**, click **here**.

The Lay Public

The "lay public" is made up of all the people who are not experts in a specific field.[1] Members of the public can differ greatly in their ages, interests, experiences, and opinions. To accommodate these differences, use the following techniques:[2]

- Use analogies and visuals
- Respect your audience's prior knowledge (be mindful of "talking down')
- Address the question "so what?" early on to keep your audience interested
- Address the points that less-specialized audience members care about first, followed by the interests of the more knowledgeable audience members

Public lectures at Brown's Ladd Observatory are a good example of how to address a broad audience. Visitors to the Ladd range from families to amateur astronomers, so presenters assume their audience has little if any knowledge of the topic. This approach makes sure that no listener gets lost or loses interest during the lecture. After the lecture, speakers hold Q&A sessions that focus on specific interests of more knowledgeable audience members.

Using stories is also an effective was to engage the public. Stories help the audience understand how science works[3] and build the audience's trust in the communicator.[4] Keep the following points in mind as you develop your story:[5]

- Keep the story simple
- Focus on making the story relevant and meaningful to your audience
- Front-load the story to keep your audience interested
- Avoid jargon - use simple language but don't oversimplify
- Include the people and the process (challenges, successes, collaborations, etc.)

For more information about the role of storytelling in science communication, check out the following resources:

- *Don't Be Such a Scientist* by Randy Olson (2009)
- Telling Science Stories from Public Communication for Researchers at Carnegie Mellon University (2012)
- *Telling True Stories: A Nonfiction Writers' Guide from the Nieman Foundation at Harvard University* edited by Mark Kramer and Wendy Caller (2007)
- StoryCollider

For references, click here.

The Media

The media is a "mediator" between scientists and the public.[6] The media is not a homogenous group: Members of the media range from print journalists to television broadcasters to documentary-filmmakers. Effectively communicating with the media ensures that your research reaches interested readers, policy-makers, and other scientists.

Working with the Media

Brown's Office of News and Communications, housed in the Public Affairs and University Relations, helps Brown researchers communicate with the media about their work. Brown's Science News staff can help you develop communication materials, such as press releases.

Tips for working with the media:

- Read a few press releases to get a feel for how your research might appear in a press release and what parts of your research should and should not be included. Examples of press releases appear below.

- Bats use blood to reshape tongue for feeding
- Brown researchers build robotic bat wing
- Bats save energy by drawing in wings on upstroke

Describing your process, challenges, successes, and collaborations are important for writing an informative and engaging press release. Keeping these aspects of your research in mind will also prepare you for speaking with reporters who may call you after your press release is published.

- Read a few popular science articles to get a sense of how your research might eventually appear in the news and magazines. For example:

- Tongue Like a Mop
- Bat Research Inspires Disciplines Far Beyond Biology

Articles about your work should include visuals--videos or photos--that will draw readers' attention to the article and help them grasp the gist of the piece.

If one of your graduate students played an important part in the research, include him or her in conversations with your Science News Officer to give your student some experience working with media relations.

Resources

For more information about working with the media, check out the following resources:

- *Working with Public Information Officers* by Dennis Meredith (2010)
- Working with Print, Broadcast, and Online Media from AAAS Annual Meeting 2013: Communicating Science Seminar
- *Am I Making Myself Clear?* By Cornelia Dean (2009)

For references, click here.

Policy Makers

Scientists and policy makers have many differences, but this doesn't mean that they can't work together. Scientists can share their knowledge with policy makers through meetings, testimonies, and open presentations.

Suggestions for communicating with policy makers:[7]

- Know what issues policy makers are currently discussing and debating
- Keep your explanations simple and relevant
- Think of some actionable solutions to the problem
- Think about the problem and solution in the context of the policy maker's constituency
- Be confident in yourself and what you know
- Approach a meeting as a conversation, not a presentation
- Create a one-pager with your message and key points

For suggestions about testifying before policy makers and giving presentations, see “Making Policy” in *Am I Making Myself Clear?* By Cornelia Dean (2009).

Resources

- *Escape from the Ivory Tower* by Nancy Baron (2010)
- *Am I Making Myself Clear?* By Cornelia Dean (2009)
- Communicating Science to Policy-Makers from AAAS Annual Meeting 2013: Communicating Science Seminar
- AAAS Science & Technology Policy Fellowships
- Christine Mirzayan Science & Technology Policy Graduate Fellowship Program at the National Academies

For references, click here.

Know Your Message

Once you know your audience, you can develop your message. Your message should answer the audience's questions like **"So what?"** and **"Why should I care?"** Answers to these questions vary depending on your audience.

As a science communicator, you want to frame your message in terms that are accessible, relatable, and meaningful for your specific audience. For example, climate change scientists and advocates may frame their messages in terms of public accountability, economic development, or morality and ethics, based on their intended audience.[8]

When developing your message, think about how your audience approaches the issue and topic. People think about an issue based on the aspects of the issue that resonate with their values.[9] This "interpretive storyline"[10] helps people make decisions about complex issues.

Framing Your Message

As a science communicator, it is important to frame your message in terms that are accessible, relatable, and meaningful for your specific audience. A good example of the importance of framing occurred at the National Academies.

To update a report on evolutionary science, the National Academies used focus groups and a national survey to find the most effective way of framing their topic for a varied audience including school administrators, parents, and clergy. Unexpectedly, they learned that highlighting the connections between evolutionary science and modern medicine was the most effective way to frame the value of teaching evolutionary science in classrooms.[11]

Framing is not a way to "market" your point of view. It is a way to actively engage your audience with an issue, build trust and relationships with the public, and encourage the public to participate in dialogues about scientific issues.[12]

For references, click here.

Know Your Medium

Whether you are writing an article, giving a public lecture, or posting tweets, understanding how to use media effectively will help you successfully communicate your message.

Writing about science? Click here.

Visualizing science? Click here.

Creating a poster? Click here.

Speaking about science? Click here.

Using social media? Click here.

Writing About Science

In her book *Am I Making Myself Clear?*, Cornelia Dean offers the following suggestions for writing about science and technology:[13]

- Use active verbs
- Avoid jargon, euphemisms, clichés, wordplays, and puns
- Use analogies and examples
- Only include critical details
- Create an outline
- Tell a story but stay true to the facts
- Spend a lot of time revising and rewriting
- Cite your sources
- Prepare to be edited

Additional Resources

The **National Association of Science Writers** was started in the 1930s by a group of science journalists. Today, the Association's website has resources for science writers with a range of experiences. In addition, the association published *A Field Guide for Science Writers: The Official Guide of the National Association of Science Writers* (2005).

Other practical guides:

- *The Science Writers' Handbook* by the writers of SciLance (2013)
- *Ideas into Words: Mastering the Craft of Science Writing* by Elise Hancock (2003)
- *The Oxford Book of Modern Science Writing* by Richard Dawkins (2009)
- Scientific Writing: Beyond Tips & Tricks from Public Communication for Researchers at Carnegie Mellon University

Reading examples of good science writing will help you shape your own writing style and show you different ways to structure your story and use language effectively (Montgomery 2003). Check out these publications:

- *The Best American Science Writing 2013* edited by Siddhartha Mukherjee (2013)
- *The Best American Science and Nature Writing 2012* edited by Dan Ariely and Tim Folger (2012)
- *The Best Science Writing Online 2012* edited by Jennifer Ouellette and Bora Zivkovic (2012)
- Publications by renowned science writer Carl Zimmer

For references, click here.

Visualizing Science

Visuals make the data supporting your message clear and accessible to your audience.[14] Science visualizations include:[15]

- Information graphics (infographics)
- Conceptual diagrams
- Satellite photos
- Maps
- Photographs
- Graphs
- Tables
- Any combination of the above in a poster, newsletter, or presentation slides

The visuals you create for communicating with the public may differ from those you include in your scientific publications. Keep the following points in mind as you create your visuals:[16]

- Use a consistent style and format
- Use colors with purpose
- Use high-resolution graphics
- Format your graphics and include labels, legends, and captions

Visualization Resources

The following resources provide valuable insight and guidance about visualizing science for the public:

- *Communicating Science Effectively: A Practical Handbook for Integrating Visuals* by Thomas et al. (2006)
- *Visual Strategies: A Practical Guide to Graphics for Scientists and Engineers* by Felice Frankel (2012)
- *The Visual Display of Quantitative Information* by Edward Tufte (2001)
- *The Functional Art: An introduction to information graphics and visualizations* by Alberto Cairo (2012)
- Visualizing Science from AAAS Annual Meeting 2013: Communicating Science Seminar
- Selected Tools from datavisualization.ch
- 10 Steps to Designing an Amazing Infographic from Fast Company
- Points of View from Nature Methods
- For examples of effective visualizations, visit the following sites:
- 2012: The Year in Graphics by the New York Times
- Visual.ly
- Scientific Visualization Studio at the Goddard Space Flight Center, NASA
- International Science and Engineering Visualization Challenge from the National Science Foundation

For references, click here.

Creating Posters

Different types of visuals often come together in a scientific poster and act as visual aids when you present your research. If possible, use desktop publishing software to make your posters; this will help you create uniform graphics, fonts, and other visuals.

"Bottom line" rules for making posters:[17]

- Remember that your title is your message
- Be intentional in your choice of colors
- Use high resolution visuals
- Use photos for the general public
- Use conceptual diagrams for the informed public and non-specialist scientists
- Use supporting visuals even if your audience is scientists in your field
- Use text to support your visuals
- Create a handout of the poster

Poster Creation Resources

- Science Poster Design from the Cornell Center for Materials Research
- *Poster Design: A practical guide for researchers* from the Wellcome Trust and DesignScience (2013)
- *Poster Design: A practical guide for scientists and engineers* from the British Science Association (2013)
- Poster Presentations - Designing Effective Posters from the University at Buffalo Libraries (this is a collection of links to useful resources)
- Creating Effective Poster Presentations from North Carolina State University

For references, click here.

Speaking About Science

Scientists are often asked to give presentations about their work or about a topic in their field. To make an effective presentation, be sure to:[18] [19]

- Give yourself plenty of time to prepare and practice
- State your message at the beginning and end of the presentation
- Give your audience background on your topic
- Focus on the aspects that are most interesting and relevant to your audience and introduce them early on
- Engage your audience through questions and dialogue
- Explain your visuals and use them to support your presentation
- Talk about the process, not just the results
- Aim to use less time than you are allotted
- Leave time for questions
- Based on what you know about the audience, try to predict their questions and prepare answers

Using Slides

If you use slides with your presentation, think carefully about how they will support your presentation, not dominate it. Using slides appropriately will make your presentation engaging and impactful. Using visuals inappropriately distracts the audience and detracts from their experience.

If you use slides:[20]

- Spend one to two minutes per slide
- Each slide should have a visual element
- Explain your visuals to your audience
- Include an outline slide

Presentation Resources

Most general guides to science communication have a section about presenting scientific topics and using slides effectively. The two publications below cover the essentials.

- Scientific Presentation Skills by Melissa A. Hines, Department of Chemistry, Cornell University for Center for Nanoscale Systems, Cornell University
- How to Communicate Science and Scientific Research to a Broad Audience by J. Paul Robinson, Professor, Purdue University

For references, click here.

Using Social Media

Scientists use blogs and other social media platforms such as Twitter and Facebook for a variety of purposes. They write for general audiences about their research, post their reactions to depictions of science in popular culture, and share information about professional matters with other scientists.[21]

Social Media Resources

Brown University's Social Media Guidelines provide basic guidelines for how to use social media ethically and effectively. All members of the Brown community who use social media are encouraged to read this document.

The following resources provide how-to guides, tools, and suggestions for becoming a social media user:

- Engaging with Social Media from AAAS Annual Meeting 2013: Communicating Science Seminar
- Shorty awards in #Science
- Web and Emerging Technology Resources for Scientists and Partners from The Superfund Research Center, Oregon State University
- An Introduction to Social Media for Scientists by Holly M. Bik and Miriam C. Goldstein
- ScienceOnline

For references, click here.

Models of Science Communication

Communication between scientists and the public has been characterized in three different ways: the deficit model, the contextual model, and the participation model. Thinking about your science communication practice in terms of these models may help you communicate more effectively with your audience.[22]

The Deficit Model

This model assumes that public skepticism about science is caused by the public's lack of relevant knowledge.[23] In this approach, scientists can remedy the "deficit" by sharing their knowledge with the public. The hope is that addressing the knowledge "deficit" will lead to more public support for science.[24] In the deficit model, the transfer of knowledge is one-way and top-down.[25]

The deficit model is closely associated with the post-WWII call for science literacy. Policy makers and educators in the 1950s realized that citizens needed to be "scientifically literate" to support science and make informed decisions about rapid developments in science and technology.[26] Being scientifically literate meant understanding basic scientific principles, the scientific process, and the role of science in society.[27]

The Contextual Model

Like the deficit model, scientists in the contextual model share their information with the public. But, in this model, scientists also put themselves in their audience's shoes. They are aware of the needs, attitudes, and existing knowledge of their different audiences and adjust their content and communication approach accordingly.[28] Some questions that science communicators using this model might ask themselves are:[29]

- What does my audience already know about this topic?
- Why does my audience need the information I am communicating to them?
- What will my audience do with the information I am communicating to them?
- How will my audience feel about my methods?
- What is the future of my research and how will it apply to my audience?

The Participation Model

In this model, scientists, the public, and policymakers participate equally in discussions and debates about issues in science and technology.[30] Discussions and debates may occur in a variety of formats, such as consensus conferences and public forums. One variation of the participation model is "upstream engagement". This variation proposes public debates about potential scientific and technological developments before they occur, instead of reactive debates post-development.[31]

Activities based on the participation model encourage members of the public to learn about a scientific topic and its implications for society. These activities also strengthen relationships between scientists and the public and inspire further public participation in scientific debates.[32]

For references, click here.

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