# Communicating Scientific Data Effectively

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"Just as there is science to be communicated, there is a science of communication."

- Fischhoff and Scheufele, 2013

# Overview

- Importance of effective communication
- 10 science communication essentials
- The "art" of effectively communicating science



Importance of Effective Science Communication



https://blogs.scientificamerican.com/ guest-blog/effective-communicationbetter-science/ "Science communication is part of a scientist's everyday life. Scientists must give talks, write papers and proposals, communicate with a variety of audiences, and educate others."

"Effective communication means transmitting your message clearly and concisely so that it is understood."

"When scientists communicate more effectively, science thrives."

# Importance of effective science communication

- Can facilitate the link between knowledge and action
- Can inform and empower the audience to produce change
- Leads to enhanced scientific understanding which can lead to paradigm shifts
- Communicating results is a significant part of doing science





### 1. Know your audience

- Who are you communicating with?
- Tailor communication based on the group's interests



### 2. Identify your objective(s)

What do you want your audience to learn or walk away with?

- Educate
- Advocate
- Raise awareness
- Build trust/credibility
- Influence policy/future research
- Secure future funding
- Encourage change
- Be part of a dialogue/gather feedback



# 3. Start with the most important information

- Scientific and medical communities provide
  - background → methods → results → conclusion
- Public, media and business stakeholders absorb information in the opposite order as scientific papers
  - conclusion → results → methods → (background)

https://www.aaas.org/resources/communication-toolkit



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# 4. Know when to use jargon

- Acronyms, abbreviations and technical terms can be used in research papers and presentations to other scientists in your field
- Use commonly understood terms and when communicating to a broader audience or a mixed audience



### 5. Be relatable

- Use stories and analogies
- Let your personality shine through
- Show enthusiasm!



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# 6. Use a balance of visuals and text

- Charts, graphs and photos make the presentation more engaging
- Use as few words as possible



## 7. Follow the rule of 3s

- Focus and emphasize 3 major points
- Boosts memory of your audience
- Helps you stay focused and remember what you want to say



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THE STOP LOOK & LISTEN ROAD SAFETY SHOW



Image: Constraint of the second state of the second sta



#### 3 step process for communicating your science





8. Talk about the scientific *process* 

- Scientific results rarely yield a concrete yes or no answer
- Explain why you chose certain research methods
- Explain how you got to your results
- Describe next steps that you will take and why



# 9. Focus on the bigger impact

- Relate your research to the bigger picture
- Why is this research important?



# 10. Develop an elevator pitch

- Help someone quickly understand the value of your research
- Explain why your research is exciting and relevant
- What problem are you trying to solve?

- 1. Know your audience
- 2. Identify your objectives
- 3. Start with the most important information
- 4. Know when to use jargon
- 5. Be relatable
- 6. Use a balance of visuals and text
- 7. Follow the rule of 3s
- 8. Talk about the scientific process
- 9. Focus on the bigger impact
- 10. Develop an elevator pitch

# The "art" of communicating science

# The "art" of communicating science



# **L** Data Visualization

- Tables
- Charts
- Statistical graphics
- Plots
- Infographics

Month	Number of Visit
January	1
February	
March	1
April	
Мау	1
June	
July	1
August	
September	
October	1
November	
December	

LOSS OF SPECIES

**1 OUT OF 4** Amphibians

MAMMALS 8

OUT OF 7

WFR TO STOP THE LOSS

EVERY (20) MINUTES

EVERY

70%

LOST A YEAF

MINUTES

75% OF GENETIO DIVERSITY IN GRICULTURAL CROP HAS BEEN LOS

IODIVERSITY IS NECESSARY FOR

30 YEARS





![](_page_22_Figure_9.jpeg)

# **L** Data Visualization

Visualizing data helps to:

- Tell a story without using a lot of text
- Identify patterns in the data
- Provide a new or unique perspective on a dataset
- Make complex data more accessible, understandable and useable
- Communicate information clearly and efficiently

![](_page_23_Picture_7.jpeg)

# **L** Data Visualization

#### Do's:

- Know the point of the visualization
- Use visual cues to help guide audience through the data (colors, symbols, and shapes)
- Keep it simple and eliminate chart "junk"
- Function first (type of chart), then form (colors, legend, size, fonts, etc.)
- ✓ Be consistent with your form

#### Don'ts:

- Use colors that aren't easily differentiated
- Give too much information at once
- Use uneven intervals or axes that exaggerate differences within the data
- ✓ Use bad data

# **Lata Visualization**

Samples per station

![](_page_25_Figure_2.jpeg)

■ Station 1 ■ Station 2 □ Station 3

# <u>.</u> Concentration of Chemical X (mg/L)

### **Data Visualization**

Concentration of Chemical X Measured in 4 Treatments

![](_page_26_Figure_3.jpeg)

![](_page_27_Picture_0.jpeg)

# **Conceptual Diagrams**

- Can also be called a thought drawing or system drawing
- Used to communicate processes and relationships in a visually appealing and understandable format
- Uses colors, symbols, shapes to represent elements
- Uses lines and arrows to represent relationships between elements

![](_page_27_Figure_6.jpeg)

![](_page_28_Picture_0.jpeg)

# **Conceptual Diagrams**

- Reasons to use conceptual drawings:
  - Communicate key messages and visualize scientific data
  - Provide a better understanding of the "big picture"
  - Span cultural boundaries and language barriers
  - Can help clarify thinking and facilitate further communication
  - Identify data gaps, management priorities and key features/threats

![](_page_28_Picture_8.jpeg)

![](_page_29_Picture_0.jpeg)

#### Used to:

- Display data spatially
- Provide geographical context or point of reference
- Identify geographic patterns in spatial and/or non-spatial data
- Identify hot spots or areas of interest

![](_page_29_Figure_6.jpeg)

![](_page_30_Picture_0.jpeg)

#### Elements should include:

- Legend
- Scale
- Reference points
- Title
- Consistent and appropriate colors
- Simplicity
- Appropriate size to emphasize the point of the map
- Zoom ins/blow outs of areas of interest
- As few layers as possible to convey the point

#### Map: Los Angeles River Watershed

![](_page_30_Figure_12.jpeg)

Credit: Council for Watershed Health

![](_page_31_Picture_0.jpeg)

- Powerful visualizations
- Can be used to communicate results
- Can be used to make communication materials more appealing
- Can underscore results more effectively than words
- Can help translate complex scientific ideas

![](_page_31_Picture_6.jpeg)

Watson & Lom, 2008

![](_page_31_Picture_8.jpeg)

Photo from Unsplash.com

![](_page_32_Picture_0.jpeg)

Free sources of photos: Take your own www.flickr.com www.istockphoto.com www.unsplash.com www.designerspics.com www.freedigitalphotos.net www.burst.shopify.com

![](_page_33_Picture_0.jpeg)

- Dress for success
- Make eye contact
- Find a balance with your volume and speed
- Sit/stand up straight
- Practice your presentation
- Do an A/V check and get familiar with your surroundings
- Take advantage of public speaking opportunities

![](_page_33_Picture_8.jpeg)

![](_page_33_Picture_9.jpeg)

![](_page_34_Picture_0.jpeg)

#### Review

- Importance of effective science communication
- Science communication essentials
- The "art" of effectively communicating science

### **Recommended Reading**

- Fischhoff, B., & Scheufele, D. A. (2013). The science of science communication. Introduction. *Proceedings of the National Academy of Sciences of the United States of America*, 110 Suppl 3(Suppl 3), 14031– 14032. <u>https://doi.org/10.1073/pnas.1312080110</u>
- Kuehne, et al. (2014) Practical science communication strategies for graduate students. *Conservation Biology*. 28(5). 1225-1235 <u>https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/cobi.12305</u>
- Watson FL, & Lom B. (2008) More than a picture: helping undergraduates learn to communicate through scientific images. *CBE Life Sci Educ.*, 7(1):27-35. doi:10.1187/cbe.07-07-0045 <u>https://www.lifescied.org/doi/full/10.1187/cbe.07-07-0045</u>
- <u>www.sciencevisualizationclass.wordpress.com</u> (Univ. Maryland Center for Environmental Science)

# **Questions?**