SCIENCE COMMUNICATIONS TOOLKIT

Contents

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Know Your Tools

Know Your Audience

Your message should be tailored to the audience receiving the information. Establish trust with the audience—acknowledge their priorities.

Tighten-up Your Language

With some audience specific exceptions, any technical terms should be eliminated. Metaphors and analogies can be a good substitute. If technical jargon must be used, explain it simply and briefly.

Pare Down Ideas

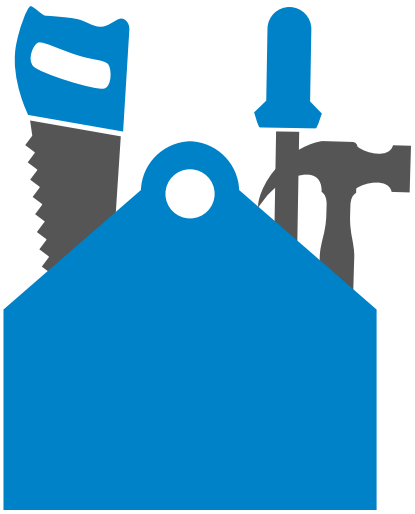
Before speaking to the public, take a minute and reduce the scope of your ideas. Can you deliver your message in five sentences? This helps reduce unnecessary information and makes your message more digestible.

Construct a Story

Audiences respond best to narrative forms. Why is this a problem and how can we respond? Scientists can be like detectives, trying to find information and solve problems. Good communication with stakeholders tells a clear, compelling story about that problem.

Make Your Points

Know what points you are trying to make before you speak. Begin with the key points and repeat them as necessary.



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What We Think Vs. What We Say

When we took the reading from the **DO meter,** we found the water was **hypoxic.**

Limit Jargon

Our tests indicated that the water was hypoxic, meaning it had very low oxygen.

151,915 lbs of total suspended solids enter the Fox River per year.

Contextualize Numbers

The Fox River receives 151,915 pounds of solids a year, which is the same as 27 dump trucks each day.

Trees and other plants absorb contaminants into their roots, and transform them into less harmful byproducts.

Use Metaphors and Analogies

Vegetation acts as a filter, absorbing pollutants and transforming them into less harmful byproducts. When this filtering is reduced, it creates problems with water quality.

High levels of nitrogen in the water can increase algae growth and reduce oxygen in the water.

Connect to the Audience's Concerns

It is important to have safe and clean water to maintain the **health of our communities.** High levels of nitrogen in water can increase algae growth, reduce water oxygen and harm fish and plants.

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Developing Cultural Competency

Start early and engage often. Meeting with leaders of the community long before work starts or funding deadlines approach is essential in building trust and assessing community needs. Don't approach communities with the idea of "helping" them or with set ideas; ideas should be co-developed.

Demonstrate respect. Communities may have different worldviews, values or religious or cultural viewpoints than you. Provide opportunities for them to state their views and be open to new perspectives. When doing field research, ask permission first to help build a positive interaction with a community. Avoid assuming you have a right to access lands or knowledge.

Dialogue is key to building trust. Including a question-and-answer session in a presentation, for example, can help your audience process and connect to what you are presenting. Also consider different facilitation techniques to accommodate different ways of learning.

Do your homework. Learn about how the topic you are studying affects a specific community before you engage in outreach. Try to learn about how an individual community's perspectives and values interact with your work.

Demonstrate cultural competency. Identities are both personal and systemic. Cultural identities can value relationships over tasks, or individual over communal achievements, or prefer verbal to written communication. Understanding these aspects of cultural background for a specific audience will make your communication the most respectful and effective.

Tell a story. Remember that there are almost always humans behind numbers. Simply reporting on objective facts misses a broader context. Science and science communication that is community minded is more effective in reaching diverse audiences. Numbers and facts may not be the most compelling to all audiences; rather, anecdotes and storytelling may be a more effective way to communicate.

Diversify your engagement strategies. When planning meetings or events, consider the needs of the community you're working with. Plan on attending community events in advance, consider meeting outside of regular business hours at a central location, and provide refreshments or attendance incentives if possible to increase engagement or cover meeting costs. Consider which types of outreach strategies (phone calls, in-person events, social media, one-page fact sheets, TV and newspaper interviews) may be most effective in reaching diverse communities.

Don't give up. Communities you want to engage with may be marginalized or have historically been exploited by your people or organization. In addition to better understanding their culture and concerns in advance of starting work, understand that relationship and trust building may take a long time.

Jurin et al. (2010). *Environmental Communication: Skills and Principles for Natural Resource Managers, Scientists, and Engineers.*

Antonucci, C., Auyong, M., Behl, M., Burich, D., Chan, S., Covi, M., Faulds, A., Harrison, J., Kolesar, S., Lewandowski, E., Lovelace, S., Merrill, J., Peroff, D., Pleasant, M. (2020). *Diversity, Equity and inclusion: Current conditions and best practices across the National Sea Grant Network.* seagrant.noaa.gov/Portals/1/DEI%20Best%20Practices%20Paper.pdf.go.wisc.edu/5u76so; go.wisc.edu/5u76so

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Explaining Science to Nonscientists

ISTCOK

This will likely be a common type of science communication in which you engage. This is a diverse type of communication that includes anything from a TV or radio interview to a conversation with someone who studies English to a Thanksgiving dialogue with your grandparents. These tips are relevant for any type of interaction; adjust as necessary for your specific audience.

1. **Avoid acronyms and jargon.** Using jargon and acronyms can be a useful shorthand for scientists speaking with colleagues. Be aware of the terms you are using, especially in a radio or television interview when your audience will not have the ability to ask clarifying questions.

2. **Contextualize your information.** Numbers only mean something within a specific context. You may have that context, but those you are speaking with likely do not. For example: if you are attempting to motivate action on climate change by saying that sea levels are rising 2 cm per year, your audience may not care because that number seems incredibly small. Your audience is best served when you explain the data along with sharing it. In the case of the sea level example, you can explain that, while this may appear to be a negligible amount, sea level rise has doubled in the last two decades and will likely only increase from here.

3. **Use metaphors or analogies.** Metaphors and analogies are a very effective way to scale and ground your information in something relatable. This is comparable to the point regarding contextualization. Using these tools will make your message more memorable. (See: "What We Think vs. What We Say.")

4. **Focus on why they should care.** When talking to non-scientists, the focus should be on the implications of your science to their everyday lives. Why should your audience care that Lake Michigan's water levels are rising?

5. **(Probably) leave out some details.** As a scientist, every detail will seem important to you (in your context, it is!). However, someone less invested in your research is likely to lose interest quickly, so exclude details and focus on a few key takeaways.

6. **Lead with the point.** Although it may not always be your first instinct, leading with the point is essential. It ensures that if people get confused, stop paying attention, or turn off the TV, they will at least have heard your main message.

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Explaining Your Science to a Community Stakeholder

This is a classic part of science communication, where you can connect your work to community needs and inspire change. You may be asked to present about your work at a public hearing or a town meeting.

1. **Connect to their concerns.** People care about the health and safety of their communities, they care where their tax money is being spent, and they care about the functionality of their public spaces. Connect your research to something that is important to your audience.
2. **Trust is essential.** Community members want to believe that you are working in their best interest. This is especially difficult if the information that you are presenting is contrary to what they already believe. Try to connect and relate to people at a personal level and be transparent about your motivations.
3. **Provide methods only when they are relevant to results.** Complicated statistics or sample replication, although relevant to a scientific publication, may not be particularly relevant to a community audience. Present only methods that are relevant to key takeaways. For example, it could be relevant to discuss which sites you chose to test and why but not the logarithmic scale you used to graph results.
4. **Inspire action.** Presenting to community stakeholders is a perfect time to give them agency over their own community. If you are working on stormwater pollution, for example, encourage local homeowners to install rain barrels or pick up their pet waste. Connect them to local organizations doing related work that can benefit their community.
5. **Avoid overly technical language.** As always, science communication is best without jargon or acronyms. Make a point to use the names of places instead of site numbers and use easy-to-interpret graphics and visuals, when appropriate. Tell a story rather than just presenting data and results.
6. **Listen and engage.** A two-way flow of information (from you to the public and from the public to you) is an excellent way to build trust and understand your audiences' concerns. Although you may be an expert on the science, they are experts in the needs of their community. For smaller groups, make time for discussion during the presentation. Incorporating a question-and-answer segment at the end of a presentation is a good way to facilitate this two-way flow in larger groups.
7. **Accommodate needs of community members.** Think of how to best reach and engage specific stakeholders. For example, a phone call or printed flyer may work better than email to reach community members. Consider holding meetings outside of regular business hours and provide refreshments.
8. **Get to know your audience.** If time allows, have brief introductions from the audience and have them explain why they are attending. This will help you connect with stakeholders and allow them to build relationships with each other.

SCIENCE COMMUNICATIONS TOOLKIT

Explaining Your Science to Elected Officials

To make sure your research is heard by those in charge of shaping policy, it may be beneficial to meet with a local, state or federal government official. Additionally, representatives will often reach out to scientists when they need an expert opinion. Before meeting with an elected official, consider these tips.

1. **You will most likely speak to a staffer.** Elected officials are busy, and meetings are often with a member of their staff. Research online who on the official's team to contact. Mention enough specifics in your meeting request that you can be redirected if necessary.
2. **Dress professionally.** Although it seems obvious, it is important not to overlook dress code. If you are dressed too casually, your message might not be taken seriously. Meetings with members of the U.S. Congress, state legislature, local county board or city council should warrant the same (business professional) dress code.
3. **Have a plan.** Meetings can be as short as five minutes, so be intentional and prepared. Know before you go into the meeting what action items you would like from the policymakers and what you can do for them considering their policy priorities.
4. **Prepare a one-page summary.** Policymakers are busy with many issues at the same time. To make sure you and your message are remembered, prepare a one-page summary of your key points. (See "How to Write an Effective Policy Brief.") Leave this and your contact information with the office after the meeting.
5. **Timing is key.** If you are attempting to meet with a federal representative, you can avoid their busy D.C. schedule by waiting until they are working from their home district. Recesses vary but are typically in August, as well as around holidays. When meeting with state and local officials, be aware of their busier cycles, such as budget-making periods.
6. **Select a representative intentionally.** Members of an elected body (state or federal) serve on different committees and have different levels of investment in issues. It is considered best practice to reach out to your representative as a constituent, but you should also attempt to schedule a meeting with someone who is invested in and connected with your issue.
7. **Consider meeting with those running for office.** No matter what level of government someone is running for, these meetings could help shape debate and ultimately influence future policy.

SCIENCE COMMUNICATIONS TOOLKIT

Explaining Your Science to a Possible Employer

Whether in an informal setting, like networking at a conference or meeting for coffee, or a formal setting, like inquiring about a posted position, it is important to know how to explain your research to a potential employer. See "The Job Hunt" for more tips on formal job applications.

1. **Avoid the most technical and specific aspects of your research.** The person you are speaking with may not be a specialist in your field or be well versed in the lingo of your previous institution. While you can assume that they have a working scientific knowledge base, they may not know the nuanced specifics of your work. Limiting jargon and acronyms will help you communicate clearly, even to other scientists. Emphasize broad research topics or focus areas you specialize in rather than specific details, unless prompted.
2. **Show that you are curious.** Ask about a potential employer's published work and their research. If you are talking to someone in the corporate world, ask about the company goals. Curiosity is a key aspect of scientific thinking, so it helps to demonstrate it when you can.
3. **Practice.** The more you talk about your research to different audiences, the more easily you will be able consolidate your work into its main points. This is essential when talking to a potential employer, both because, as previously stated, they may not be experts in your field and it demonstrates that you understand the broader significance of the work you are doing. (See "Elevator Speech.")
4. **Send cold emails to reach out.** If you are unsure of where you would like to work or are trying to expand your network of potential employers, reach out to those who are doing work you are interested in, even if you have never spoken to them. Make sure that the cold email is as easy to respond to as possible. One example of a potential cold email template would include the point of the email in the subject line, a brief introduction of yourself, why you are interested in meeting with this specific person, and some potential times for a coffee meeting, zoom call or phone call. Make sure that your email can be read in less than one minute.
5. **Be persistent without being overbearing.** Plan to follow up with potential employers you meet regularly to let them know what you are doing professionally to advance your career. You never know when an opportunity will come up, and if your name is fresh in their mind, you may have a shot at landing a position. It never hurts to build a professional network.
6. **Ask people to talk about you.** Your professional network can be your greatest asset when it comes to being aware of opportunities. At informal settings, ask people if they know anyone doing the work you are interested in. This can both expand your network and make you aware of additional opportunities. You can say something like "now that you know a bit about my interests, is there anyone in your organization you think I should speak to?"

Chen, A. (2015) *Cold Emails and Hot Coffee: Take Action on Your Career.* Science. DOI: 10.1126/science.caredit.a1500157

Shrader, W.T (2009) *How to Give a Job Seminar and Why It's Not the Same as a Regular Scientific Presentation.* Office of Intramural Training and Education, NIH.

SCIENCE COMMUNICATIONS TOOLKIT

Explaining Your Science to Students in Pre-K through Grade 3

If you are someone conducting research, odds are that any interaction you have with young children in a school setting will be as a guest speaker or in some type of outreach role. Children at this age are curious and open to learning. Your goal here is introducing them to science and encouraging them to pursue that curiosity. Following the tips below will be an excellent start to guiding your messaging and content.

1. **Stay focused.** You may want to begin by briefly explaining what a scientist does. Explain that scientists ask their questions in a certain way so other scientists can do what they did and see if they get the same answer. Talk about what you know best and stick to the purpose of your visit. If a child asks an off-topic question about another science idea, you can answer it briefly but your research on the adaptive attributes of fish body forms should not turn into a 40-minute lesson on gravity. If children ask an off-topic question you can say "that's a great question that needs more research." This avoids making them feel dismissed but keeps you on topic.
2. **Kids learn in many ways and at this age they are very curious and inquisitive.** They are open to hands-on learning with real props and materials. Be ready to shed formal pretense and have fun with the children. You can use sensory experiences, experimentation, storytelling or movement to spark their curiosity. Bring props and activities that they can participate in! Anything they can smell, feel or see will greatly help them remember key concepts and keep them engaged. If your research is on algae, bring some for them to look at. Rather than passing items through the group, unless you have many samples of the same item, or the group size is small, you may want to hold the item and walk amongst the children. In this way one child (especially the first child the item is handed to) does not monopolize the time with the item. If you're teaching the water cycle, have them turn it into a dance with the "water cycle boogie."
3. **Don't completely avoid the vocabulary.** Young children may not remember the word hypoxia, but they will remember that sometimes, if there's not enough oxygen, fish can't breathe. So, say the big word, have them repeat it and explain it in a way they can digest. Young students love learning new words, but due to limited time, chose a few that you would like them to retain.
4. **Keep it short.** Depending on the ages of the students, you will have 5-30 minutes of their attention span. Plan to do other activities than just speak to them or ask questions of them (maybe they pretend to be algae and must run around and pick up all the phosphorus cards, play an interactive game, or give them a mock "science experiment") to get your point across.
5. **Be careful with question time.** Although younger students often ask great, perceptive questions, they can occasionally be off topic. Keep your questions very direct (but not closed—simple yes and no responses). For example: "What lives in the water and uses fins to swim?" (This question is still open enough to generate a wide variety of responses, but not so open that you'll generate a list of every aquatic animal.) Also avoid prompts that are open ended or you will end up getting stories about their uncle's dog and have lost their attention.
6. **Relax and have fun.** Children are very receptive to adult energy, confidence and enthusiasm. Check with the classroom teacher about classroom rules. Be sure not to encourage students to engage with you in a way that would break the rules. For example, is there a rule for students to raise their hand rather than calling out an answer? Informal education has a bit more flexibility than a traditional lesson, so it may involve more movement, noise and excitement. Come in with a plan, engage their senses and make sure to laugh. Your visit will be an experience they remember. Encourage them to bring up something they have learned today to a friend or family member.

SCIENCE COMMUNICATIONS TOOLKIT

Explaining Your Science to Students in Grades 4 through 8

If you are someone conducting research, odds are that any interaction you have with children in a school setting will be as a guest speaker or in some type of outreach role. Your experience can introduce them to new ideas and help them see real-life applications of concepts they are learning about. Following the tips below will be an excellent start to guiding your messaging and content.

1. **Stay focused.** Talk about what you know best and stick to the purpose of your visit. If a student asks an off-topic question about another science idea, you can answer it briefly, but your research on fish genetics in response to chemical pollutants should not turn into a 40-minute lesson on gravity. If children ask an off-topic question you can say, "that's a great question that needs more research" or refer them to a scientist who has investigated that type of issue. This avoids making them feel dismissed but keeps you on topic.
2. **Kids learn through sensory experiences and hands-on activity.** This means bring props! How do you know if a prop is age appropriate? Ask yourself, is this item something the students have likely seen or interacted with before? If it is, then ask yourself whether having the students interact with it again will shed new insights into an already familiar item. If the answer to the first question is yes, and the answer to the second question is no, then the prop may not be age appropriate. Anything they can smell, feel or see will greatly help them remember key concepts and keep them engaged. If possible, bring multiples of the same prop — especially if you intend to pass it around the room. That way, the last student to interact with the item has an opportunity to do so relatively soon after you have talked about it. With only one item, hold it yourself and walk around the room.
3. **Don't completely avoid the vocabulary.** Upper elementary and middle school students may not know the word hypoxia, but they understand conceptually that sometimes, if there's not enough oxygen, fish can't breathe. Using larger vocabulary words to provide language around an idea is important. So, define the word in a way they can digest. If the word is difficult to pronounce you may want to have them repeat it. If possible, provide opportunities for students to authentically use the word (e.g., in response to a question you ask). This should only be done with one or two key words in your research so as not to be too overwhelming.
4. **Keep it short.** Depending on the ages of the students, you will have 10-45 minutes of their attention span. Plan to do other activities than just speak to them or ask questions of them (maybe they complete different stations around the classroom, play an interactive game or work on a mock "science experiment") to get your point across.
5. **Word your questions carefully.** Keep questions to the group very direct (example: "What lives in the water?"). If you want students to raise their hands, rather than calling out, direct them to do so. Be very careful only to interact with students who have raised their hand and been called on. Upper elementary and middle school is a great time to have students practice their writing. You can have them write down the answers to your questions before answering.
6. **Relax and have fun.** Kids are very receptive to adult energy, confidence and enthusiasm. Check with the classroom teacher about classroom rules and how your planned activity connects to prior and future lessons and/or previously expressed student interests. Informal education has a bit more flexibility than a traditional lesson, so it may involve more movement, noise and excitement. Come in with a plan, engage their senses and make sure to laugh. Your visit will be an experience they remember. Encourage them to bring up something they have learned today to a friend or family member.

SCIENCE COMMUNICATIONS TOOLKIT

Explaining Your Science to Students in High School

Unlike elementary school children, high school students have begun considering their future careers with a certain level of seriousness. While the goal of presenting to this group is still teaching them science, keep in mind that you can inspire them to consider a career in science.

1. **Try to incorporate project-based learning.** Hands-on learning is key at any age. Depending on the amount of time you are interacting with the students, this will take different forms. If you have multiple sessions, consider having the students do a project that illustrates your message. Maybe they design an aquaponics system or identify fish. If that is not possible, bring tangibles to pass around and highlight key points.
2. **Use Props.** If possible, bring multiples of the same prop—especially if you intend to pass it around the room. That way, the last student to interact with the item has an opportunity to do so relatively soon after you have talked about it. Alternatively, hold the item yourself and walk around the room positioning yourself so students have a chance to clearly interact with the item.
3. **Ask discussion questions that relate to your research.** Lecturing is a quick way to lose any audience. High school students are starting to use their critical thinking skills to articulate their own opinions of the world. Tap into this process by asking discussion questions that relate to your research. "Why do you think oxygen levels in the Colorado River are important?" or "What part of this data set stands out to you?" This will also help them make the connection between your research and big picture ideas (covered in tip 6).
4. **Respect their knowledge base.** High school students will respond particularly negatively to being underestimated. It is a good idea to connect with their teacher before the presentation to get an idea of what they have already covered. School district standards can sometimes, but not always, be found online.
5. **Jargon should be limited but included.** Teaching requires using words that they may not be familiar with, so your presentation can and should include scientific language. Remember to define the jargon that you do use. For example: "Quagga mussels have taken over the benthic communities (which means all of the creatures that live at the very bottom) of Lake Michigan."
6. **Note the big picture significance of your research.** As previously mentioned, students at this age are beginning to solidify their opinions. This is a key time to demonstrate to them that science matters broadly to our world. What does it mean for science to be credible? How can science help us imagine and create a better future? How does your research move our understanding forward? Effective science communication should always answer the question "why should we, the audience, care?" With this demographic, reinforce the implications of science for the world at large.
7. **Explain your career path and any obstacles you overcame.** High school students are considering their own career paths. Often students are curious about how scientists achieved the position they occupy. Consider including a brief overview of your career path. Also indicate whether you accept high school volunteers or paid interns to assist with your research. If not, provide details (not just a statement to take math and science courses) of how students may move into this type of career.

Seelman, G (2011). A Scientist's Guide to Making Successful Presentations to High School Students: How to Leave Them Wanting More. *National Human Genome Project.*

SCIENCE COMMUNICATIONS TOOLKIT

A Guide to Newspaper, Television and Radio Interviews

The 411 on Journalists

Journalists are not your enemy and are almost always trying to get the best information for their story. However, the world of journalism moves more quickly than the scientific process and is primarily concerned with narrative. Knowing the "so what?" aspect of your research well, and beginning by tying that into your conclusions will allow for the best interview. There is likely a story in your conclusions, even if more research needs to be done. With a well-intentioned journalist, focusing on what you do know and not adding caveats unless they are especially necessary will help you get information out most effectively.

What if You Don't Know the Answer?

1. Don't panic! It is okay that you don't know. If the question is not relevant, redirect the interview by saying something like, "What's really important here is…"
2. Reframe the question to focus on what you do know. Bring it back to one of your main points.
3. Do not say "no comment." Answer every question honestly even if the answer is that you don't know the answer.

Other General Tips

1. Prepare by thinking about what you do and do not want to say. Decide on three main points you would like to come across in the interview.
2. YOU are in control, not the journalist. Frame the answers to their questions so that they relate back to the points you want the audience to take home.
3. Follow the general rules of science communication. Use metaphors and analogies if you can, avoid jargon, keep answers short.

Radio Interview

1. In most cases, there is no "re-listening" so details like specific numbers and dates are likely to get lost, especially if they are mentioned in the same sentence. Spread them out in the interview.
2. Include anecdotes to maintain the attention of the audience, which is likely focused on multiple things at once.
3. Put a special focus on detailed visual descriptions since there are no accompanying pictures.

Newspaper Interview

1. Prepare "soundbite" quotes ahead of time and try to incorporate these into the interview.
2. Try to avoid saying things "off the record" and make sure you know the interviewing organization's policies about this ahead of time.
3. You many not be quoted directly, but remember it was still valuable to do the interview and your perspective is likely still included in the story.

Television Interview

1. Because there is so much going on, focus on one key message.
2. If you are doing field work (or even lab work), record some footage and provide it to the network.
3. Sentences should have a clear, definitive end. This is helpful in the editing process and ensures your key points do not get cut out.
4. Be yourself, even if it seems unfamiliar and stressful to be on camera.

Baron, N (2010). Escape from the Ivory Tower. Island Press: Washington D.C.
Harrington, M. Tips for Giving an Interview. Wisconsin Sea Grant.

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Good Graphing

An effective graph communicates one clear message.
Use the minimum amount of detail necessary to convey your point.

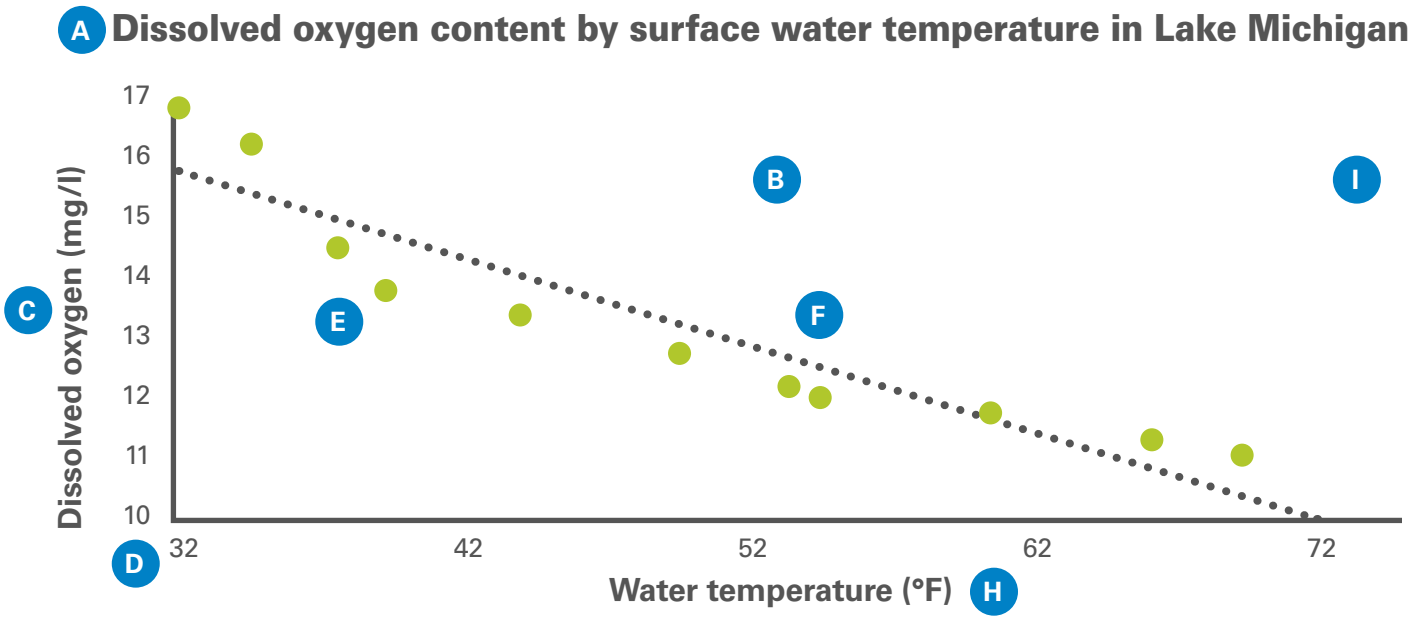

Figure 1: Relationship between the concentration of dissolved oxygen and temperature in the surface water of Lake Michigan 5 meters from the shoreline G

A Create a clear and descriptive title.

B Avoid gridlines. Communicate your message with the fewest marks possible.

C Label axes and include units.

D Match scaling to data — represent data with a small enough scale so that trends are visible. If you have two graphs that are presenting different aspects of the same information the scaling should be identical.

E Graphs are often reproduced in one color, so use color only to enhance content.

F If trendlines are included, but if they are they should indicate the type of relationship between the data points. For this to be significant, the r-squared value of the trendline must be as close to one as possible (i.e., 0.9829.)

G Captions should describe what is graphed (X-axis vs Y-axis) and details of the experiment.

H Be attentive to type format. Use superscripts or subscripts (for exponents, degrees, etc.). Be consistent and intentional with labeling (all caps, upper and lower case or sentence style).

I Select the type of graph to best demonstrate your data. If you are demonstrating a change in one value over another (in this case change in dissolved oxygen (D.O.) over temperature) use a line graph. If you want to compare the value of something in different situations (for example: dissolved oxygen at a consistent temperature in six inland lakes) use a bar graph.

SCIENCE COMMUNICATIONS TOOLKIT

Tips for an Effective PowerPoint

Slide Design/Formatting

Start with an outline of what you are going to cover—this will orient your audience and remind them of the goals of the presentation.

Stick to a consistent formatting. All slides should have the same background color and font. Simpler is better as it allows the audience to focus on your information and not the slide background. Be careful to select colors that contrast so text is easy to read.

Use simple language and short phrases. Bullet points should be only one line of text and limited to three or four points. This will encourage the audience to actively listen to what you are saying, rather than just reading the slides.

Try to have as large a font as possible, even if it means splitting up some of the denser slides. It is important for the entire audience to be able to read the text.

Animated transitions and effects likely should not be included. They can be distracting and make the presentation seem less professional.

Pictures & Graphics

Every slide should include at least one picture or graphic. This will give the audience something to look at and make the presentation more engaging. Avoid adding too many pictures, which will make the slide seem crowded.

Use pictures as talking points, especially pictures of field work or lab methods. For example: "As you can see here, there is notably more algae in the pond that had higher phosphorus runoff."

When possible, describe the picture without including text on the screen.

When using charts, tables or graphs, make sure they are legible, well explained and only include one per slide.

The Presentation

Spending too little time on a slide can make the presentation feel frantic, and spending too much time on a slide can lose the audience. A good rule of thumb for pacing is 1–2 minutes per slide.

The words on the slide are not intended to be speaker notes. Have your own notes somewhere so you are not tempted to read off the screen when you are presenting.

Follow the general rules of public speaking: Face the audience, speak slowly and clearly, look up from notes when possible and practice. The goal is to keep the audience focused on you and your story, not your slides.

If you have a lot of information, have a one-pager available to give out at the end of the presentation.

SCIENCE COMMUNICATIONS TOOLKIT

Social Media Tips for Scientists and Science Students

Make It Accessible

@UWiscSeaGrant

Make your social media outreach digestible to the largest number of viewers. That means limiting jargon, focusing on the "so what" and including photos whenever possible.

Use Hashtags Wisely

@UWiscSeaGrant

Use the #Hashtag feature. With hashtags, your post will be cataloged with other posts that share the same tags. A post with #LakeMichigan is more general and less targeted than #WhiteSuckerMigration. Decide which (or both) is best for the audience you want to reach.

Humanize Yourself

University of Wisconsin Sea Grant/Water Resource Institutes

Don't be afraid to humanize yourself and your research! Include photos of yourself in the lab or the field, or even out on a walk. The public connects with good stories, make yourself part of the story of your research and your work.

Network with Others

@UWiscSeaGrant

Use social media to network and engage with your community. Follow research institutions, other scientists in your field and non-governmental organizations that are doing interesting and relevant work. Retweet or repost what they are doing, and engage with them in the comments of their posts if you are interested in learning more.

Be Professional

Tips for Using LinkedIn

1. Make sure all of your bio is completed.
2. Do not post anything on a professional account that has to do with your personal life (vacations, buying an house, etc.).
3. Have a professional name and a professional photo on accounts being used for work or networking.
4. Your page should be updated along with your paper resume.

Use Visuals

@UWiscSeaGrant

Photos of the lab, the field or graphs used in publications are a good way to engage the audience in your work. When possible, try to include photos.

Use Social Media to Your Advantage

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Overall, social media is a great way to promote your work, show potential employers what you have to offer and connect with other professionals in your field. Don't be afraid to use it to your advantage. Post and tweet consistently. An account that languishes without fresh content will be ignored.

Post at Strategic Times

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Posts and tweets on weekdays will get more attention. Also, certain times of the day are more effective. Try tweeting and posting to Instagram between 11 a.m. and 2 p.m. (CT). On Facebook, popular times are 9 a.m. to 1 p.m. (CT) and on LinkedIn it's 9 a.m. to noon (CT).

SCIENCE COMMUNICATIONS TOOLKIT

The Job Hunt

How to communicate your scientific research in interviews, cover letters and resumes

The Resume

- Use **hard numbers.** "Collected 32 samples over the course of 3 months"
- Frame experience as **accomplishment statements** that include an action and a result. "Collected 32 samples over 3 months that were used to determine trends in Lake Michigan algae growth"
- Highlight **hard skills** such as equipment or computer programs you used to collect and analyze your data. "Used ArcGIS to map measured oxygen concentrations"
- **Soft skills** such as communication and teamwork can be included in your resume but should be left for the interview or cover letter if possible. "Networked with other student scientists to share data, resulting in three additional layers to the ArcGIS map"
- **List** any published work, scholarships, presentations, academic recognition or other accomplishments associated with your research.

The Cover Letter

- Cover letters should be **tailored individually** to a specific job. Even if you reuse some of the same concepts, adjusting the letter beyond just inserting the different name of the employer will be beneficial.
- Employ your cover letter to **expand on** or **highlight** concepts from your resume. For example, if you received a scholarship, you can expand on the requirements for that scholarship and how having those skills will make you a good fit for the particular position.
- Write with **intention** and know what skills you want to highlight before you begin your draft. The cover letter should be less than a page long and easy to read. Make sure you are communicating all you can in that small amount of space.
- Be **confident**. During your research you have demonstrated critical thinking skills, communication skills, teamwork, academic ability and attention to detail. This is the place for the confidence in those abilities to come across.

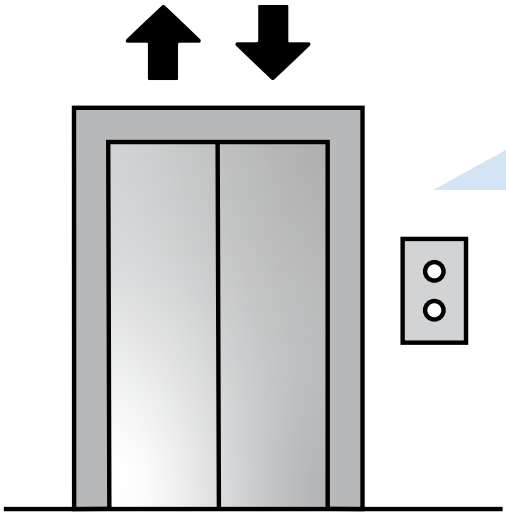
The Interview

- Have **vignettes** prepared that highlight certain skills. Develop these ahead of time so they can be applied to questions being asked. Focus them on a specific skill you would like to highlight in an interview. Ask yourself—was there a problem with your data you had to solve? Was there a conclusion that was particularly difficult to draw? How did you resolve these issues?
- If you are given a **"no win" question** such as "what is your greatest weakness?" Keep the answer short, you do not want this to be the most memorable part of the interview.
- Consider interviews as **conversations.** You should be both listening and talking. If there is something about the employer that does not seem to match what you expected, ask about it!

SCIENCE COMMUNICATIONS TOOLKIT

The Elevator Speech

How to give a quick answer to the question "so…what do you do?"



30-Second Version

- A one- or two-sentence version of you and your work.
- Start the next sentence with an introduction and general topic you are studying (ex: "I am a PhD student at UW–Milwaukee studying the diets of lake trout in Lake Superior").
- End the sentence with broader significance or anticipated results (ex: "Because the native populations of this fish have been reduced in the Great Lakes it is important to the ecosystem to monitor their growth and movement").

60-Second Version

- This version can include more details. Maybe a hypothesis that was originally accepted but now proven wrong, or an expanded version of broader significance.
- A longer version has space to use an analogy to contextualize background information. This makes your pitch more accessible.
- Keep out the jargon, but include any necessary concepts, for example saying "dead zones" instead of "hypoxic."

90-Second Version

- Humanize yourself with an anecdote or personal story. Why is this research so important to you?
- Depending on the context, you can engage with the person you are speaking with. Did something seem to strike them as particularly interesting?

Some General Tips

- You can consider your elevator pitch to be in "acts." Act one establishes setting (include conflict or tension). Act two illustrates the rising action (what you are doing to address the tension). Act three presents the resolution (what answers you have found or are expecting to find).
- Start with the longer version and reduce it into the shorter version.
- Have this prepared and practice! It is more difficult than you think to condense your work on the spot, so this is something to have in your back pocket.
- Practice out loud. Consider videotaping yourself and practicing in front of a friend or mentor.

Olson, R. (2018) *Don't Be Such a Scientist: Talking Substance in an Age of Style*. Island Press.
Elevator pitch. ASLO. (2020, October 6). Retrieved September 20, 2021, from aslo.org/science-communication/elevator-pitch/.

SCIENCE COMMUNICATIONS TOOLKIT

How to Write an Effective Policy Brief

What is a policy brief? What should be in it?

A policy brief is a concise summary of a topic. It is designed to be read by political figures or community stakeholders and inform them on an issue that current policy is either not addressing or is addressing inadequately. It is not a political analysis but is instead a document intended to provide information on an issue. The policy brief should focus on big-picture consequences and avoid discussion about methods. It should also communicate urgency and give stakeholders reasons why this issue is important.

Many organizations cannot advocate directly! Know which type of brief is most appropriate before writing.

ADVOCACY BRIEF: This is a policy brief where you are advocating to an elected official for a particular policy. Your goal here is to convince them that a specific policy is the best course of action to take on this issue.

OBJECTIVE BRIEF: This is a policy brief where you do not express an opinion about what is the most effective policy. Your goal here is to outline and summarize different options based on facts and peer-reviewed research to provide information to a policy maker.

Formatting and design

- Usually, policy briefs should only be one page. If necessary, it can be two but try to keep it to about 700 words.
- Effective policy briefs use full color.
- Minimize the white space on the page.
- Include pictures, graphs or charts. Make sure to include a caption that explains how they connect to the information you are presenting.
- Avoid trying to include more information by aggressively shrinking fonts. This will make it difficult for your audience to read.
- It is best to use single-spaced columns for ease of reading.
- Make it look professional. Visual presentation is essential to the effectiveness of this tool. And ask someone to proofread.

Why write a policy brief

1. It is an efficient and effective way to communicate the big picture of your research to those who can make necessary changes.
2. It provides a broader context for your work by reinforcing its practical applications.
3. It provides an access point for concerned citizens looking to understand an issue.

General structure

Title: This should be catchy and engaging; the goal of the title is to make people want to learn more.

Executive Summary: First, provide a clear statement of the policy or issue the brief addresses. Then, have one paragraph explaining what the policy brief covers. Like the abstract of a scientific publication, it is best to write this last.

Background: Provide the parameters of the issue. Who is it affecting? Why is it important?

Body: What is the current state of the policy around this issue? What are other alternatives for policy?

Recommendation: In an advocacy brief, include your professional opinion on what policy should be implemented.

Conclusion: Briefly restate the issue and existing policy. Summarize overview of policy alternatives and, if advocating, which you recommend.

References: Include all sources at the end of the brief.

Theil, A. (2019) Let's keep this brief: a concise guide to writing a policy brief. *UW–Milwaukee School of Freshwater Sciences.*
Food and Agriculture Organization (2011) 4.1 Writing effective reports. *Food Security Communications Tool Kit.*

SCIENCE COMMUNICATIONS TOOLKIT

How to Write an Effective White Paper

What Is a White Paper?

A white paper is an in-depth review of a specific problem written by experts. It should be solution focused, describing both the background of a particular problem and what can be done to solve it.

The Elements of a White Paper

1. **Title.** The title of a white paper should be engaging and informative, almost existing in a middle ground between the title of a scientific paper and a policy brief. (See "Scientific Publications 101" and "How to Write an Effective Policy Brief.")
2. **Abstract.** Summarizes the contents, including relevant details.
3. **Background and Problem Statement.** Explain to your readers what issue you are addressing and the necessary background information.
4. **Solution/Recommendations.** Use your expertise to suggest solutions to the problems you have described. Maybe it is a government policy or a recommended action by property owners.
5. **Conclusion.** Summarize the main points of the background and reiterate suggested solutions.
6. **References.** Cite all literature and sources referenced.

Formatting an Effective White Paper

1. **Length.** There is no maximum length for an effective white paper. Although it will likely be longer than three pages, include as much information as necessary to give a clear picture of both the problem and the solutions.
2. **Tone.** The tone of a white paper should be formal.
3. **Graphics.** Include data, numbers and charts or graphs when applicable. These are excellent tools to examine the scope of the problem. Although traditional white papers were text only, that is no longer a requirement and in fact often hinders engagement with your product.
4. **Audience.** Know your audience. There are different types of white papers. Some are designed to be read by a government office or elected official and some are intended to be read by a community stakeholder. Make sure your recommendations are within the agency of your target audience.

Cullen, M (2011). How to write a white paper: a definitive guide. *Instructional Solutions.* instructionalsolutions.com/blog/how-to-write-white-paper

SCIENCE COMMUNICATIONS TOOLKIT

Scientific Publications 101

Title: Clear description of your work that reflects the goals and methods of the paper but not results. If possible, keep the title around 10-12 words.

Abstract: A summary of your paper.

- Keep the abstract concise, around 200 words.
- Although this is the first section in your paper, it is best to save it for last when writing.
- Sometimes the abstract is the only part of your paper that an individual will read; make sure it conveys the key points you would like to get across.

Introduction: This section gives readers a background on the topic you have researched for context.

- A literature review may be included in this section or stand alone in the following section. The literature review will clarify how a hypothesis and research questions were developed and how the paper will contribute to existing research. Theories tested in the paper must be explained and supported with citations.
- Write in present tense.
- End the introduction with the purpose of your research and specific research questions that will be addressed in the paper. What problems or gaps in literature review are you addressing?

Methods: This section explains what you did and how you did it.

- The methods section should make it clear how the study was structured (ex: time period, study region, how data was collected), providing rationale for choices made as needed. Include description of the instrument or materials used to conduct the study (ex: interview protocol, lab equipment, software).
- Describe how data were analyzed. Statistical methods should be included in this section as well as experimental methods.
- Include enough details and information that the study could be repeated.

Results: This section explains what you found.

- Results are different from data. Data are numerical whereas results are given as text that illuminates the significance of said numbers. Both should be included in this section.
- This section should address the answer to the question posed in the introduction.
- Graphs, tables and charts are included in this section. (See "Good Graphing: The Basics.")

Discussion/Conclusion: This is the place where all the information is tied together. Highlight the significance of the paper and how it relates to other publications.

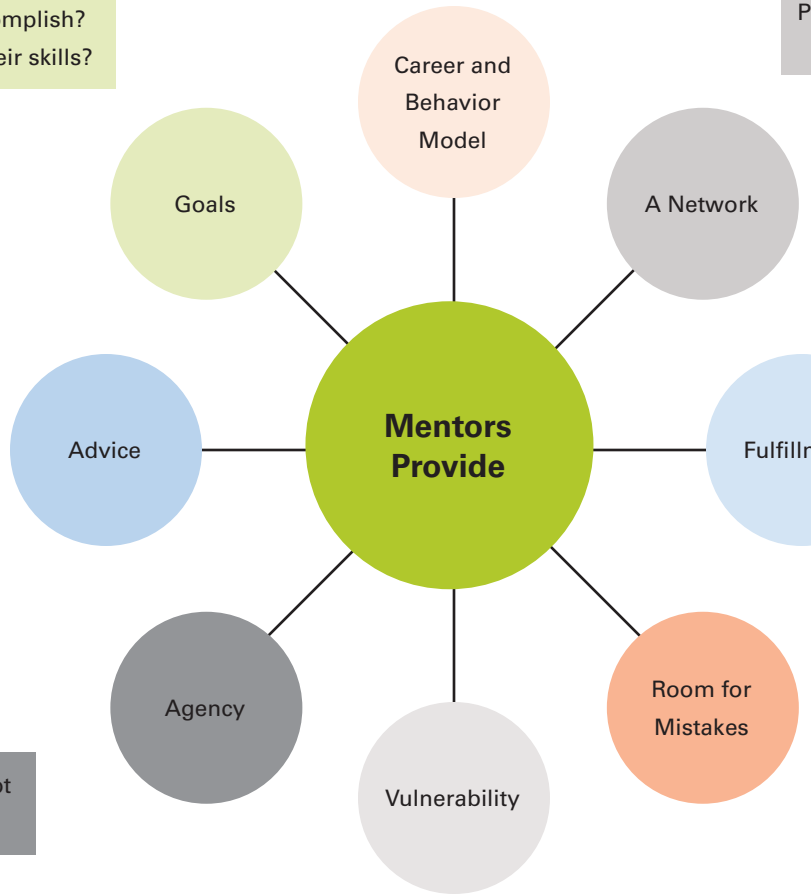
- Be careful that you are not just repeating your introduction. This should be new information.
- Include the possibility of other interpretations of your results. In other words, are there explanations that are different from the conclusions you have drawn?
- Address what else needs to be explored to understand this issue further.

References: Any literature used to gather information for your paper should be cited at the end. Use the style of reference formatting preferred by your discipline or the journals most relevant to your field.

Aramagan, A. (2013) How to write an introduction section to a scientific article? *Turkish Journal of Urology.* DOI: 10.5152/tud.2013.046
Hess, D. (2004) How to write and effective discussion. *Respiratory Care,* 49 (10) 1238-1241.
Hoogenboom, B. (2012). How to write a scientific article. *International Journal of Sports Physical Therapy.* 7 (5) 512-517.

SCIENCE COMMUNICATIONS TOOLKIT

Mentorship



Be available, organized and intentional, but keep proper boundaries and don't over promise.

Handle situations professionally.

Make reasonable goals. What can your mentee accomplish? Do the goals reflect their skills?

Provide them with opportunities via your contacts.

Encourage them to have the confidence to reach out to their contacts.

Scale the goals, make them step by step and check in on the progress.

Mentoring is a satisfying process for both parties—you should enjoy working with your mentee.

Understand your mentee, give advice that speaks to your experience but is applicable to them.

Working with you should overall benefit your mentee professionally and personally.

All good advice starts with active listening. Hear what they need before you respond.

Sometimes, we learn best through mistakes. Your mentees will make them, and that's okay.

Remember that you are not their boss or parent.

Help them rebuild and refocus after mistakes.

Remember that they alone determine their trajectory, you are there to guide and advise.

Humanize yourself—where have you struggled, where have you failed?

Be transparent about your experience—that will provide the best lessons.