



Effective Scientific Presentations Across Formats: A Modern Guide for Science Trainees and Researchers

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ABSTRACT

This paper presents a comprehensive tutorial on delivering effective scientific presentations in the modern era, addressing a landscape altered by the COVID-19 pandemic. The shift to virtual and hybrid formats has fundamentally changed the norms of how scientific findings are shared, creating new challenges and opportunities for presenters. Drawing from over a decade of experience teaching and refining presentation skills, we address a soft-skill gap in clinical and translational science training. The tutorial outlines four key topics: (1) identifying your scientific story, (2) using effective slide design, (3) presenting data, and (4) delivering your presentation. These lessons, developed through extensive seminars and individual coaching at various academic institutions, enable researchers to enhance communication and audience engagement across presentation formats. Our approach, informed by cognitive processing and data visualization principles, has adapted to the new reality of virtual and hybrid presentations. This work contributes practical insights for optimizing presentation skills in this changed communication landscape. By offering actionable recommendations derived from real-world experience, this tutorial provides valuable guidance for science trainees, junior faculty, and established researchers across disciplines. It aims to equip readers with the necessary tools to deliver compelling scientific presentations in any format, advancing effective academic discourse in an era where virtual and hybrid presentations have become the norm.

Keywords: scientific presentation, science communication, virtual presentation, hybrid presentation, audience engagement, slide design.

INTRODUCTION

Scientific presentations are the standard accepted approach for sharing research findings, inviting critical feedback, and advancing knowledge in the scientific community. The COVID-19 pandemic significantly impacted how we work and communicate, leading to a rapid transition to virtual presentations and normalizing the value and convenience of virtual meetings. Post-pandemic, many institutions established a new normal for scientific presentations. This

includes virtual, in-person, and hybrid formats (audience split between in-person and virtual attendees).

While peer-reviewed literature on scientific presentations exists [e.g., 1-4], it largely predates the rapid shift in presentation formats precipitated by the COVID-19 pandemic. These existing studies offer valuable insights on topics such as slide design [1], evidence-based presentation practices [2], general presentation tips [3], and crafting compelling narratives [4]. However, they do not fully address the unique challenges posed by virtual and hybrid formats that have become prevalent in recent years. Our tutorial bridges this gap, offering a perspective based on over a decade of experience teaching and refining presentation skills in academic settings, including adaptation to these new formats. Developed through extensive seminars and individual coaching, our approach specifically addresses the evolving challenges of modern scientific communication. By combining established principles with insights gained from adapting to new presentation environments, we provide practical, up-to-date guidance for effective scientific communication across all current formats. While numerous non-peer-reviewed resources on presentations exist, these generally apply to the broader topics of public speaking and general presentations rather than specifically to scientific presentations. Our focus on scientific literature and recent developments in academic settings distinguishes this work and ensures its relevance to the scientific community. This flexible approach has important implications for effective science communication. Presenting in different formats creates unique challenges and opportunities, requiring careful consideration of content, design, and delivery to engage all attendees. For example, in-person presentations allow for direct eye contact, while virtual presentations rely heavily on voice and slide quality. These differences and varying technological factors (e.g., microphone quality and audience device capabilities) significantly impact presentation design and delivery. Presenters may need to adjust their speaking style and slide complexity and be prepared to troubleshoot technical issues based on the format and anticipated audience conditions. Presenting effectively across formats is essential in today's diverse work environments. Mastery of presentation software, virtual meeting platforms, and associated hardware is now as important as traditional public speaking skills, offering new ways to engage audiences and present complex scientific information.

This article provides principles for effective scientific presentations across various formats, targeting science trainees and junior faculty and offering valuable content for established researchers. For newer presenters, it introduces fundamental concepts, while for experienced researchers, it serves as a refresher on core principles and provides new insights required for modern presentation formats. The article covers four key areas: (1) identifying your scientific story, (2) using effective slide design, (3) presenting data, and (4) delivering your presentation with attention to format-specific nuances. Through practical tips and guidance, it aims to equip all readers, regardless of experience level, with the knowledge and tools necessary to deliver compelling scientific presentations in any format, including the increasingly common virtual and hybrid settings.

IDENTIFYING YOUR SCIENTIFIC STORY

The scientific story you can tell in a presentation is different in form and content than the one you tell in a published report of your research. To craft the best story for a presentation, consider these key questions:

- *Who is my audience, and how will they be participating?* Consider their background, interests, and whether they'll be in-person, virtual, or a mix. This affects what story you tell and how you engage with them.
- *How much time do I have, and how might this vary across formats?* Be sure to consider speaking time versus discussion time. Virtual presentations may require more interaction points to maintain audience engagement. Additionally, audience interactions in virtual settings often take longer due to technical considerations (e.g., participants needing to unmute themselves, potential audio delays, or managing the chat feature). Account for this extra time when planning your presentation and allocating time for questions or discussion.
- *Realistically, where can I bring this audience by the end of the presentation?* A good presentation transforms the audience [5]. They should leave with new insights or a different way of thinking. Given the nature of the audience, the presentation format, and the time allotted, consider what key messages you can communicate effectively. If someone were to describe your presentation's key point(s) to a colleague, what would you want them to say?

Once you have decided on the key message(s), determine what the audience needs to know to grasp this. Remember, a presentation is not a research article describing all aspects of the rationale, methods, results, and discussion. Include only what is necessary to make your key points. If people want further details, they can ask questions or read your paper afterward.

To develop your scientific story, consider creating an outline or a mind map on paper or using digital tools (e.g., MindMeister, www.mindmeister.com; MindManager, www.mindmanager.com MindNode, www.mindnode.com) to visualize relationships between ideas. This approach helps maintain narrative flow and identify the most efficient way to tell your story before you start making slides. Prematurely creating slides can make it harder to track the overall narrative and invites distractions (e.g., choosing layouts, fonts, and graphics).

When developing your story, consider how the presentation format and associated technology might affect it. Different formats offer unique opportunities and challenges for audience engagement. For instance, virtual presentations using platforms like Zoom allow for easy integration of real-time polling or chat-based Q&A sessions, which can boost interaction. In-person presentations might leverage physical demonstrations or encourage brief group discussions. Hybrid settings could combine these approaches, perhaps using digital tools for remote participants while facilitating direct interactions with the in-person audience. Build flexibility to allow for varying levels of interaction and detail depending on the presentation format. Prepare alternative engagement strategies that can be adapted for virtual, in-person, or hybrid settings. This adaptability ensures your presentation remains engaging and effective across all formats, allowing you to leverage the strengths of each environment while mitigating potential limitations.

Once you have a strong outline or narrative representation, you can consider how best to communicate those points through slides and your presentation, considering potential variations in audience participation and technological considerations.

CREATING EFFECTIVE SLIDES

When creating slides for your scientific presentation, it is important to consider the varying conditions and challenges across different presentation formats. In-person, virtual, and hybrid presentations each present unique consideration for slide design and audience engagement. From large projection screens to small tablets, from controlled lighting to varied home environments, the conditions under which your slides will be viewed can differ dramatically.

With these diverse scenarios in mind, let's explore strategies for creating slides that effectively engage your audience while accommodating the potential limitations of each presentation format.

Every Pixel Counts

An important principle to remember is that every pixel of screen information requires the audience's cognitive effort to process and understand. Therefore, try to make each pixel helpful for understanding your story. This means omitting extraneous elements on a slide that are not meaningful for engaging the audience and telling your story [6]. Readily available slide templates, while attractive, can inadvertently incorporate unhelpful graphical elements and take up valuable slide real estate with graphical elements that do not contribute to understanding. Another place to remove unnecessary slide content is in the text (e.g., in bullet points). We recommend putting most of the text in separate speaker notes rather than forcing a slide to do the presenter's work. When it is necessary to include text, do so concisely, using only those words that help support your narration and storytelling. This approach ensures that the audience can focus on your spoken words and the visual aids simultaneously, a strategy that works effectively across all presentation formats. Additionally, having fewer words on the slide allows you to adjust your talking points more easily if you have less time than anticipated, such as in sessions with multiple speakers where earlier presenters have gone over time. Figure 1 displays two versions of the same slide, illustrating a reduction in unnecessary words; the space saved can be used for a complementary image to reinforce the meaning of the slide.

Figure 1: Comparison of Slide with More (top) versus Fewer (bottom) Words

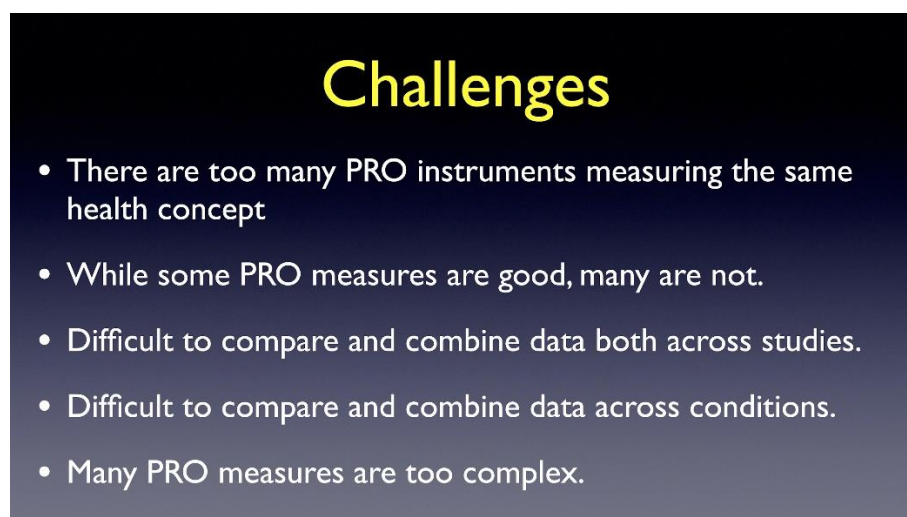




Figure 1: Two versions of the same slide illustrate the reduction in unnecessary words; the space saved can be used for a complementary image to reinforce the meaning of the slide.

Keep It Moving

For an in-person presentation, the main connection should be between the speaker and the audience, with slides providing support. However, in virtual settings, engaging with the speaker can be challenging when they often appear in a small video window on the screen. Hybrid presentations require slides to be dynamic and engaging to maintain audience interest across both in-person and virtual formats. An important strategy is to keep things moving visually on the screen. Avoid having a single slide sit on the screen for 2-3 minutes while you talk. Instead, consider splitting up the slide's content and spreading it across multiple slides, using animations to reveal different parts of more complex images on slides, or employing effects like Morph in PowerPoint or Magic Move in Keynote to move one or more slide elements across multiple slides. Morph and Magic Move are advanced transition features in their respective presentation software that allow for smooth animations of objects between slides. These techniques help maintain audience attention and enhance engagement across all presentation formats. However, there is an important caveat: in some virtual presentation scenarios, you may not control slide advancement. In these cases, frequent slide transitions or animations that require verbal cues to the individual controlling slide advancement can distract from your story and disrupt the flow for the audience. Reducing the number of slide transitions and relying more on content that can be effectively delivered on fewer, more comprehensive slides may be necessary for such presentations. The key is to balance visual engagement with the practical limitations of the presentation format.

Direct the Audience's Attention

Guiding the audience's focus on a single slide can enhance engagement. This is particularly effective for more complex slides. There are several effective techniques to achieve this:

- *Highlight with a bright box.* Place a bright yellow box behind the slide element you wish to emphasize. This box can be animated to appear at the appropriate moment in your presentation.
- *Use outlined shapes.* Draw the outline of a square or circle around the part of the slide you want to highlight. These outlines can be set to appear sequentially, aligning with your spoken narrative.

- *Adjust opacity.* Highlight certain slide parts by reducing the opacity of other elements, making the parts you do not wish the audience to focus on more transparent. This effect can be animated, gradually fading out less important elements while bringing key points into focus.

Figure 2 illustrates the first two techniques.

These techniques offer advantages over traditional tools like laser pointers, which can be difficult to see during in-person presentations and are ineffective for virtual or hybrid formats. The approaches described here are more deliberate and effective, allowing you to plan your emphasis. This preparation helps avoid unexpected challenges and ensures your emphasis is clear, dynamic, and consistent across all presentation formats.

Figure 2: Directing the Audience's Attention Through Outlined Shapes or Highlighted Boxes

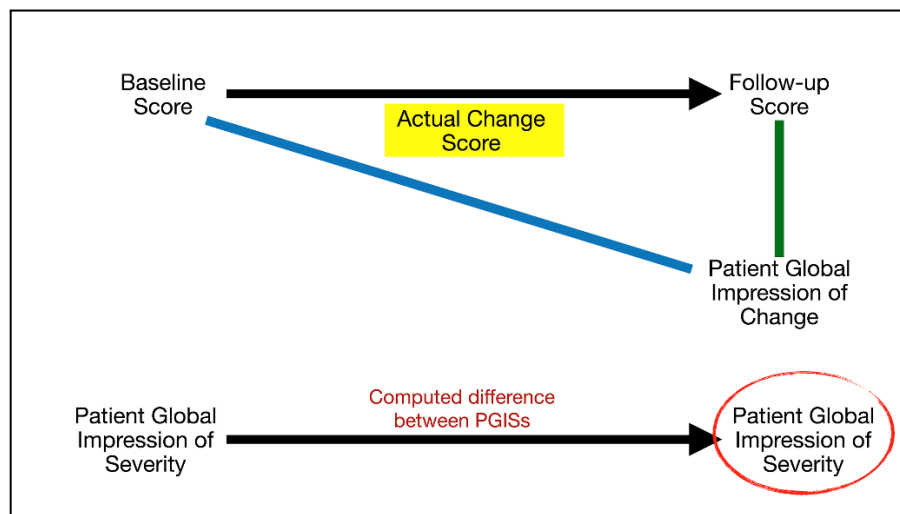


Figure 2: Direct audience attention by placing a bright yellow box behind the element you want to highlight or by placing the outline of a square or circle around it.

Use Large Enough Fonts

When creating presentations for various screen sizes, it is important to consider diverse viewing conditions. While computer screens provide better contrast than projectors in in-person presentations, preparing for challenging scenarios is important, such as audience members viewing the presentation on a smaller tablet. To ensure readability across devices:

- Use font sizes of at least 40 points for most text.
- Aim for 60 points or larger for titles and key points.
- Test your slides on different screen sizes before presenting.

If you anticipate needing to apologize to the audience for small fonts or images on a slide, revise the slide to be readable. Remember, readability is key to maintaining audience engagement across all presentation formats.

Use Relevant, High-Quality Photos and Images

High-resolution photos or images that precisely and creatively convey concepts enhance audience engagement. Low-quality images or those not closely related to your story can waste space and distract viewers. When sourcing images, explore free web-based libraries such as Pixabay (www.pixabay.com) or Noun Project (www.nounproject.com). Your institution may also provide access to premium services like Getty Images (www.gettyimages.com). When searching online, filter for high-resolution and ensure appropriate usage rights (e.g., Creative Commons). If you frequently give presentations, consider investing in a subscription to an image repository, such as iStockPhoto (www.istockphoto.com) or Shutterstock (www.shutterstock.com). While costly, these services allow for detailed searches, often yielding more specific results. Many image repositories now offer AI-generated images. You can also create custom images using AI tools such as DALL-E from OpenAI (www.openai.com/index/dall-e-3), Stable Diffusion from Stability AI (www.stability.ai), or MidJourney (www.midjourney.com). These can be highly customized for your specific presentation needs. However, the same principles apply: ensure high-resolution, precise concept conveyance, and appropriately labeled as AI-generated. Regardless of the image source, adhere to the copyright-terms and provide attribution when required.

When selecting and using images, consider several important factors. Strive for inclusivity and diversity by including representations of various genders, ethnicities, ages, and abilities. This approach ensures your presentation is respectful and relatable to a wide audience. Accessibility is equally important; choose clear and easily interpretable images, even for those with visual impairments. Add alt text descriptions for screen readers to make your presentation accessible to all audience members.

Cultural sensitivity should also guide your image selection. Be aware of cultural nuances and avoid images that might be misinterpreted or considered offensive in different cultural contexts. This consideration is particularly important for presentations to international or diverse audiences.

Relevance is key; ensure each image closely relates to your story and supports your message. Irrelevant images, no matter how visually appealing, can distract from your core points and dilute the impact of your presentation. Additionally, maintaining a consistent style of imagery throughout your presentation creates a cohesive look that enhances the overall professionalism of your work.

By carefully considering these aspects of image selection and use, you can create a presentation that is not only visually engaging but also accessible, inclusive, and respectful to all audience members, regardless of their background or abilities. This comprehensive approach to visual elements enhances the overall effectiveness and reach of your scientific communication, ensuring that your message is clear, impactful, and well-received by diverse audiences.

Figure 3: Elements of an Effective Presentation Palette

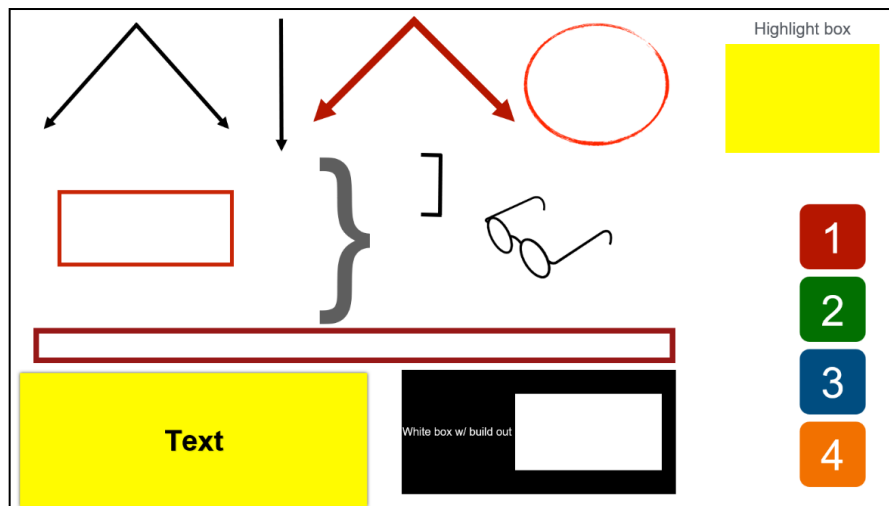


Figure 3: Sample graphical elements, including shapes, icons, highlight boxes, and numbered markers, for a reusable presentation palette. Maintaining such a palette allows quick access to pre-made elements, ensuring consistency and efficiency across multiple presentations.

Pro Tip: Keep a Presentation Palette

Creating visually engaging slides requires time and effort. To streamline this process, maintain a presentation palette – a standard presentation file containing graphical elements you have created or found useful. This approach offers several benefits:

- *Efficiency.* Quickly access pre-made elements for new presentations.
- *Consistency.* Maintain a cohesive visual style across multiple presentations.
- *Time-saving.* Store elements with their animations, further reducing preparation time.

To build your palette, save a copy of any graphical element you create or find that might be useful for future presentations. This includes shapes, icons, color schemes, or slide layouts. **Figure 3** illustrates various graphical elements that could be included in a presentation palette, such as highlight boxes, outlined shapes, and numbered icons. Investing time in building and organizing your palette will significantly speed up your slide creation process in the long run.

PRESENTING DATA

Sharing research findings by presenting data should be one of the most exciting parts of a scientific presentation. However, the informativeness and excitement of the findings are sometimes lost amidst a deluge of numbers and figures. Consider three basic principles for presenting data more effectively: (1) show only what's necessary for the story, (2) prepare people for what they will see, and (3) reveal data in steps to support your story.

Show Only What's Necessary for the Story

When writing a research manuscript, all the relevant data associated with the project are expected to be presented. In a research presentation, however, time is limited, and the audience's cognitive capacity is finite. Therefore, revisit the main story you developed (see Section 2) and determine which data are needed to support your key message(s). If you anticipate that the audience will be curious about some of the excluded data, prepare backup slides for potential use during Q&A.

Prepare People for What They Will See

Before presenting complex data visualizations of study findings, take steps to orient your audience and build anticipation. Begin by reminding the audience of the key question being addressed by the figure you will show them. This context helps frame the data in relationship to your research objectives. Next, consider revealing only part of the image initially. This approach can be particularly effective for complex figures. For example, you might start by showing just the axes or a simplified plot version without data points. This partial reveal serves multiple purposes. It allows you to orient the audience to the structure of the figure without overwhelming them with all the data at once. You can explain important features of the figure, such as what the axes represent or how different data groupings are displayed. This method builds anticipation for the full data reveal, keeping your audience engaged. It also gives the audience time to process the figure's framework before interpreting the data.

Reveal Data in Steps to Support Your Story

The gradual revelation and explanation method can significantly enhance audience understanding and engagement with your story. By progressively revealing elements of your data visualization, you can add layers of complexity in a manageable way. This step-by-step approach aids information processing by breaking down complex visualizations into more digestible parts. It transforms the presentation of data from a simple display into a guided exploration, allowing your audience to follow your thought process and more fully grasp the implications of your results.

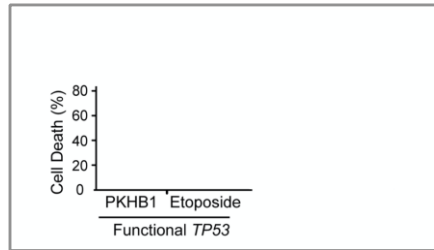
To implement this approach and prevent overwhelming the audience with complex figures, reveal data in steps that align with your narrative. For presentations created within software, use animations to reveal parts of the figure sequentially. This technique allows you to control the pace of information delivery, ensuring that each element of your data is understood before moving to the next. For pre-generated figures, you can achieve a similar effect by placing colored boxes over parts of the figure and animating their disappearance in the desired order. It is important to note that these boxes should match your slide background color. For instance, use white boxes on a white background or blue boxes on a blue background. This ensures the boxes blend seamlessly with your slide design until they are removed to reveal the data beneath. This method is particularly useful when working with published figures or when you need to use static images. By carefully orchestrating the reveal of your data, you not only make complex information more accessible but also create a sense of narrative and discovery in your presentation. This approach keeps your audience engaged and helps them follow the logical progression of your analysis and findings.

Figure 4 illustrates these principles using a published figure from Martinez-Torres et al. [7]. This example demonstrates how a complex figure can be broken down and presented step-by-step, enhancing audience comprehension and maintaining engagement throughout the data presentation.

Figure 4: Presenting a Complex Figure in Steps to Support Your Storytelling

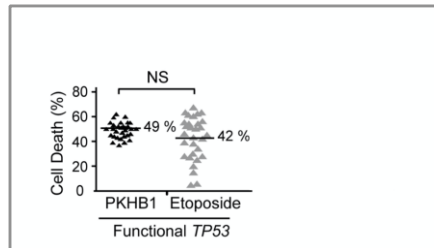
Step 1

- Remind audience of the research question these data are addressing
- Explain the X and Y axes



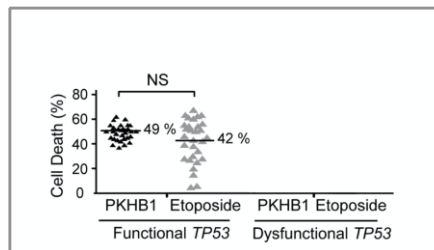
Step 2

- Reveal data for Functional TP53



Step 3

- Show X axis for Dysfunctional TP53
- Ask the audience how the pattern would be similar or different to Functional TP53



Step 4

- Reveal data for Dysfunctional TP53

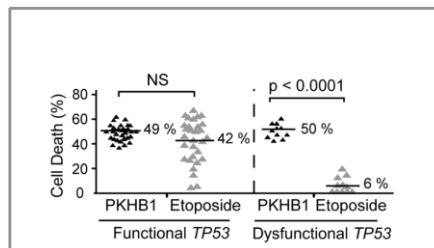


Figure 4: The successive slides demonstrate how to reveal a complex data figure in steps corresponding to your story about the data.

DELIVERING YOUR PRESENTATION

Once you have developed your slides, you should consider several factors as you prepare for your presentation. Various technical considerations complicate this preparation, some of which differ between in-person and virtual meeting environments. Today's hybrid environment may require navigating these technical aspects simultaneously if you present to in-person and remote audiences at the same time. This requires adeptness at handling the unique challenges of each format while ensuring a seamless experience for all participants.

Use High-Quality Technology to Connect with the Audience

Unlike in-person presentations, the virtual meeting environment inserts a layer of video and audio technology between you and your audience. Using a camera and microphone to deliver high-quality images and sounds is important. Consider investing in a separate, higher-quality webcam and microphone. An additional light source can ensure that your face is well-illuminated. Check that your real or virtual background does not distract from your presentation.

An advantage of the wide availability of virtual meeting platforms is that once you have set up your audio and video configuration, it can easily be tested beforehand. It is also a good idea to test your setup on the day of the presentation in case of unexpected technical glitches, such as virtual meeting platform software updates.

Enquire in Advance About the Logistics of Questions & Answers

It is important to work out in advance with the meeting host when and how questions will be handled. In virtual meeting platforms, questions can arise through various mechanisms, including hand-raising icons, chat, or a question-and-answer box. Participants might also unmute themselves and ask questions verbally. For hybrid presentations, ensure you know the in-person and virtual question-and-answer logistics.

Key questions to discuss with the host include who will be responsible for moderating and monitoring posted questions and comments, whether questions will be answered as they arise or saved for the discussion following the talk, and how Q&A interactions will take place (e.g., unmute people to elaborate on their questions vs. just reading comments and responding).

Additionally, asking the meeting host how they plan to handle situations where an attendee is unintentionally unmuted and does not realize it is helpful. This scenario can be very distracting during your talk, especially in virtual or hybrid meetings with many remote participants. Having a plan in place, such as quickly muting the person or sending them a private message, can help maintain the flow of your presentation and ensure a smooth experience for all attendees.

Practice, Practice, Practice!

Virtual meeting platforms offer a significant advantage by making it easy to practice your talk. You can start a virtual meeting on any major platform and record yourself giving your presentation. This recording can then be shared with colleagues for feedback or reviewed by yourself.

Practice recordings often yield valuable insights that can be incorporated into your final presentation, helping you communicate your message more clearly and engagingly. Repeat these practice sessions until you are confident that your presentation can be delivered within the allotted time and you are comfortable aligning your scientific story with the slides you have designed to support it.

This iterative process of practice and refinement is important for ensuring a smooth, well-timed presentation that effectively conveys your key points. It also helps you become more familiar with the technical aspects of virtual presenting, reducing the likelihood of technical issues during the actual presentation.

Speaking Tips

While much has been written about public speaking [e.g., 8-9], we highlight a few key tips that we have found particularly helpful:

- *Don't panic about pre-talk bodily sensations.* Even experienced speakers sometimes notice “butterflies in the stomach,” dry mouth, an urge to go to the bathroom, or other

types of jittery bodily sensations before speaking. Try to interpret these not as signs of anxiety but as your body preparing itself to deliver an engaging presentation. Think of a runner in the starting blocks before the race. Charged up is good!

- *Breathe and be comfortable with pauses.* Adrenaline can affect your perception of time during a talk, making you speak faster than you realize. You might also perceive brief pauses as uncomfortable silences. Be deliberate about taking deep breaths occasionally. Your body and audience will thank you.
- *Teach your talk.* The main goal of a scientific presentation is to provide the audience with new insights or perspectives. You are educating your audience, so use methods that facilitate learning. Repeat key points using different words, provide interim summaries during longer talks, and bookend your presentation with the most important takeaway messages.
- *Keep track of time.* Effective speakers monitor time closely. Ensure you have a clear view of a clock or timer to manage your allotted time effectively, including leaving room for questions. When your allotted time is up, conclude your presentation promptly. Overrunning your slot can negatively impact subsequent speakers and the audience.

Handling Questions

Under the right circumstances, the discussion and questions following a talk can be one of a presentation's most intellectually exciting parts. There are a few pointers for navigating a successful Q&A period:

- *Repeat the question for the audience.* This serves three purposes: it lets the audience know which question you are addressing (especially important for chat-based questions), allows you to confirm your understanding with the asker, and helps you formulate a good answer.
- *Don't hesitate to ask for clarification.* If a question is unclear, it is better to ask for rephrasing than to fake an answer based on assumptions. This approach is more honest and can lead to more interesting discussions.
- *For questions beyond the scope of your talk, offer to discuss them later.* Acknowledge the question's interest, explain that it was not a focus of your presented work, and offer to continue the discussion offline via email, phone, or another meeting format.
- *It's acceptable to admit when you don't know something.* A good talk often stimulates thoughts beyond current knowledge. Respond with humility and enthusiasm, e.g., "That's an interesting question. We didn't examine it in this study, but I think it's worth exploring in future work. Do you have any thoughts on what we might find?"

During the Q&A session, consider stopping screen sharing to show your face full-screen for online participants if you are presenting virtually or in a hybrid format. Alternatively, and across all presentation formats, it can be helpful to show a summary slide to remind the audience of your main points and encourage questions and discussion.

Miscellaneous Considerations

As you prepare and deliver your presentation, keep these additional points in mind:

- *Speaker visibility in virtual platforms.* In most virtual presentation platforms (e.g., Zoom), the speaker's video is displayed in a small window. Consider including a slide with a

friendly-looking picture of yourself at the beginning of the presentation. This can help the audience better connect with you, especially when your video feed is small.

- *Presentation longevity.* Many presentations on virtual platforms are recorded and posted publicly. Even if you are presenting to a small audience, your video may be widely shared via social media. Approach every talk as if a thousand people will see it, ensuring your content and delivery are of the highest quality.
- *Recording considerations.* If your presentation is recorded, be aware that some virtual platforms' default settings place a small video window of the speaker in a corner, overlaying the slides. This can obscure content beneath the speaker window. Investigate the format for recorded presentations in advance and design your slides to ensure all content remains visible, regardless of speaker window placement.

CONCLUSION

The past several years has highlighted the challenges and potential of hybrid scientific presentations. As in-person presentations have resumed, virtual presentations will remain a significant part of scientific communication. Many events now occur in a hybrid format, accommodating in-person and remote audiences.

Creating engaging presentations that connect with and inform diverse audiences requires effort and ingenuity. Virtual presentation platforms have democratized participation, allowing all audience members to contribute comments or questions easily. They've also broadened the range of scientific speakers by eliminating travel barriers.

Regardless of the format—in-person, virtual, or hybrid—the essence of an effective scientific presentation remains unchanged: Tell a compelling story that engages the audience without overwhelming their senses. The key is to communicate complex ideas clearly and concisely, adapting to the strengths and limitations of each presentation format.

Financial Support Information

The National Center for Advancing Translational Sciences (NCATS), National Institutes of Health, supported this work through the Grant Award Number 1UL1TR002553, a Clinical and Translational Science Award. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Disclosures

Dr. Grambow reports receiving consulting fees from Gilead Sciences for serving on multiple data monitoring committees. Although this relationship is not perceived to represent a conflict with the present work, it has been included in the spirit of full disclosure. Dr. Weinfurt reports no disclosures.

Use of Artificial Intelligence Tools

This tutorial is based entirely on the authors' decade-plus experience teaching and refining scientific presentation skills in an academic research environment. The manuscript's core content, including all main ideas and practical guidance, was developed without AI, reflecting our commitment to sharing genuine, experience-based knowledge.

After completing the first draft, we used AI-powered tools in a limited, supportive capacity. Grammarly (www.grammarly.com) was used for clarity, grammar, and spelling correction. Anthropic's Claude 3.5 (www.claude.ai) was employed for various refinement tasks. These included refining and restructuring existing paragraphs to improve flow and clarity, suggesting alternative wordings or phrasings for specific sections, and brainstorming additional ideas or examples to enhance existing content. Claude 3.5 also assisted in identifying potential redundancies or areas for streamlining in the manuscript, providing feedback on the logical structure and coherence of sections, and offering suggestions for integrating new ideas or considerations into existing text.

All AI-generated suggestions were critically evaluated and selectively incorporated at our discretion. These tools augmented rather than replaced our expertise. We took an iterative approach, often requesting multiple revisions or refinements to ensure the AI-generated content aligned precisely with our intentions and expertise. We take full responsibility for all ideas presented, language used, and references cited in this paper.

Our limited use of these tools aligns with our belief in leveraging technology to enhance academic work while maintaining the primacy of human expertise and critical thinking in scientific communication.

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