

# Making your science understandable

Nicholas T. Young

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@NickYoungPER

# 1. Why understandable science matters and an example



**1. Why understandable science matters and an example**

**2. Provide specific strategies to try**



# APS Committee on Informing the Public draft statement

“Systematic, ongoing, respectful, lively, two-way conversations with the public – that is, **public engagement on science – is critical to the field of physics**, including the public image of institutions hosting physics research and education, the recruitment and diversity of new generations of physicists, the scientific interest and literacy of the general public and in turn their support of physics and science more generally, and the success of physics-based applied research and development undertaken in response to specific practical societal needs.” –[Smith et al. 2021](#)





Researchers

# Simple flow of information



Non-  
academic  
public





Researchers

# Simple flow of information



Publication &  
Presentation



Media



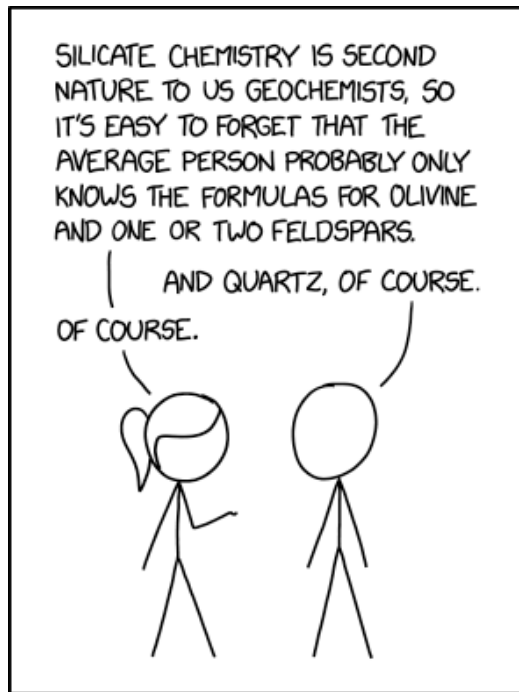
Non-  
academic  
public



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EVEN WHEN THEY'RE TRYING TO COMPENSATE FOR IT, EXPERTS IN ANYTHING WILDLY OVERESTIMATE THE AVERAGE PERSON'S FAMILIARITY WITH THEIR FIELD.

<https://xkcd.com/2501/>



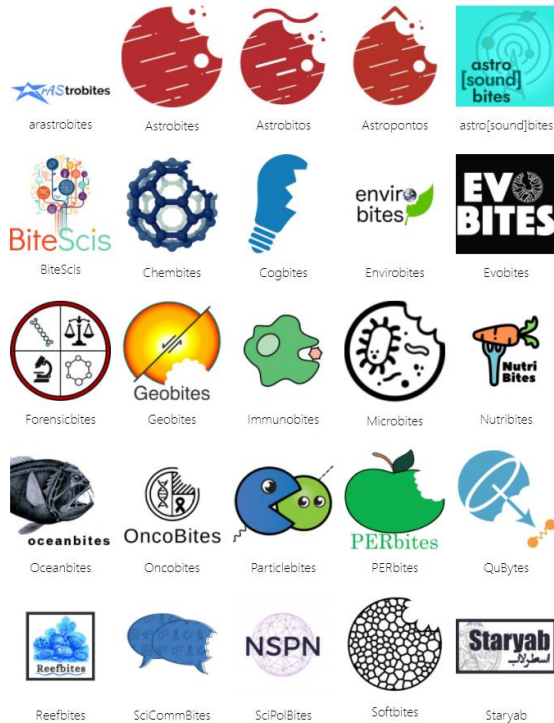


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# The Science Bites sites



<https://sciencebites.org/>

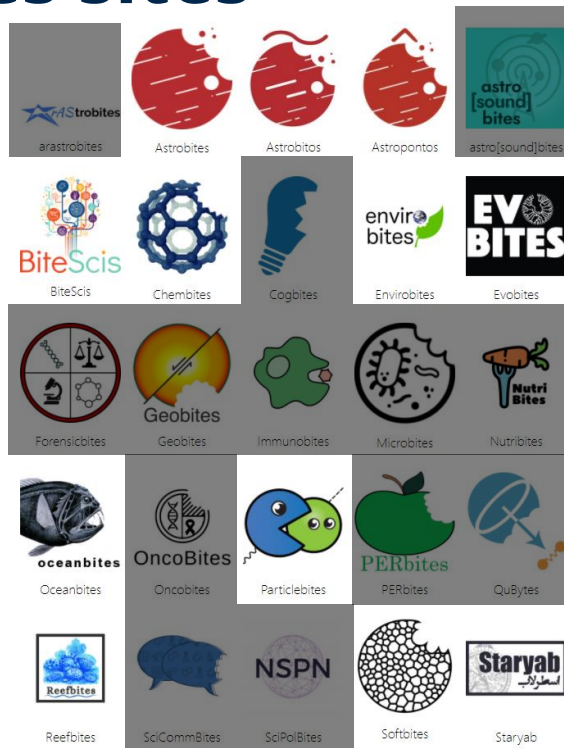


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# The Science Bites sites



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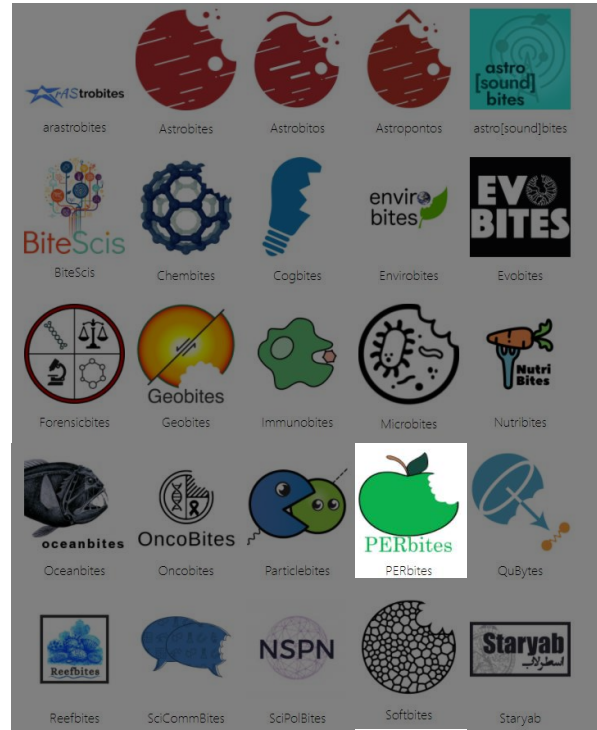


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# The Science Bites sites



<https://www.perbites.org/>



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# The PERbites model

1. Pick a recent, interesting paper



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2. Determine the overarching problem and why it matters



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2. Determine the overarching problem and why it matters
3. Explain how the researchers made progress on it





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4. State what the “new thing” is



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6. Explain the implications



# The PERbites model

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3. Explain how the researchers made progress on it
4. State what the “new thing” is
5. State what we still don’t know
6. Explain the implications
7. Write it all up in around 1,000 words!



# What we cover:



# What we cover: Instructional strategies

## Nearsightedness

When people are nearsighted, they cannot see things unless they are close. Their far point is not at infinity; it is often much closer.

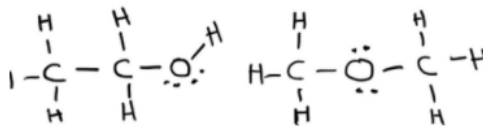
To correct this, a diverging lens is placed in front of a person's eye to create a virtual image of the object at their reduced far point. The lens equation in this case becomes:



February 16, 2022 / Nick Young

**Short post-lecture multimedia videos might help student learning**

1 minute post-lecture videos seem to do the trick.



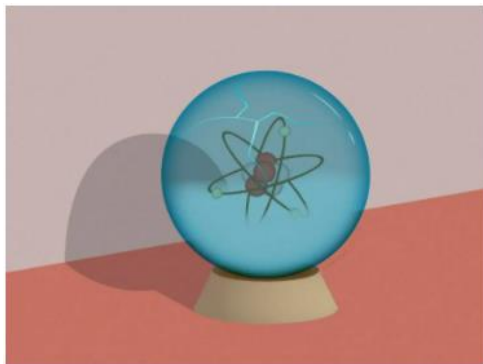
December 17, 2020 / Emily Kerr

**Interventions Encouraging Students to Draw and Reason Regarding Intermolecular Forces Improve Ability to Predict Relative Boiling Points From Lewis Structures**

Interventions encouraging students to reason through and use supporting evidence to predict boiling point trends improves student understanding



# What we cover: Educational Practice



March 24, 2021 / Elias Euler

## The inaccurate feedback of intro physics courses, especially for women

The grades students receive in intro physics don't predict their grades in advanced physics, pointing to problems of coherency and inclusivity within physics departments.



March 18, 2020 / Prasanth

## Online delivery of Research Based Assessments

Research conducted across 8 institutions, covering 2 introductory-level course and 10 upper-division courses (for a total of 1879 students), suggests that, even in the worst case, only a small percentage of students engage in behaviors such as using external resources while answering Research Based Assessments and this has a negligible effect on the class average.



# What we cover: Research Methodology



January 26, 2022 / Nick Young

## Suggestions for picking pseudonyms for research participants

Researchers need to consider a variety of factors when thinking about how to refer to study participants.



September 30, 2020 / Nick Young

## How representative are PER studies?

Not very. The participants are whiter and wealthier than the general college population.





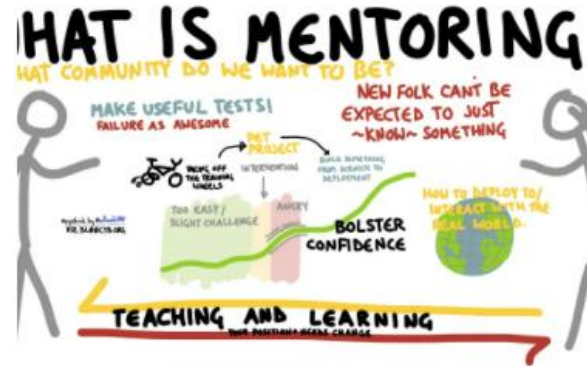
# What we cover: Professional Development



October 21, 2020 / Nick Young

## Applying to Graduate School in PER

It's that time of year! If you plan to apply to grad school, we have some tips for you.



June 26, 2019 / Nick Young

## Research-backed advice for mentoring researchers

Mentoring an undergraduate researcher for the first time or looking to improve your mentoring ability? See what the literature has to say.



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# What we cover: Diversity, Equity, and Inclusion



July 29, 2019 / Briley Lewis

## Thinking Beyond ADA Compliance: How to Make Astronomy Accessible

Title: Accessible Astronomy: Policies, Practices, and  
Strategies to Increase Participation of Astronomers  
with Disabilities Authors: Alicia Aarnio et al. First



July 15, 2020 / Nick Young

## Ideas for supporting Black women physicists

Fewer than 100 Black women have PhDs in physics.  
Something needs to change.

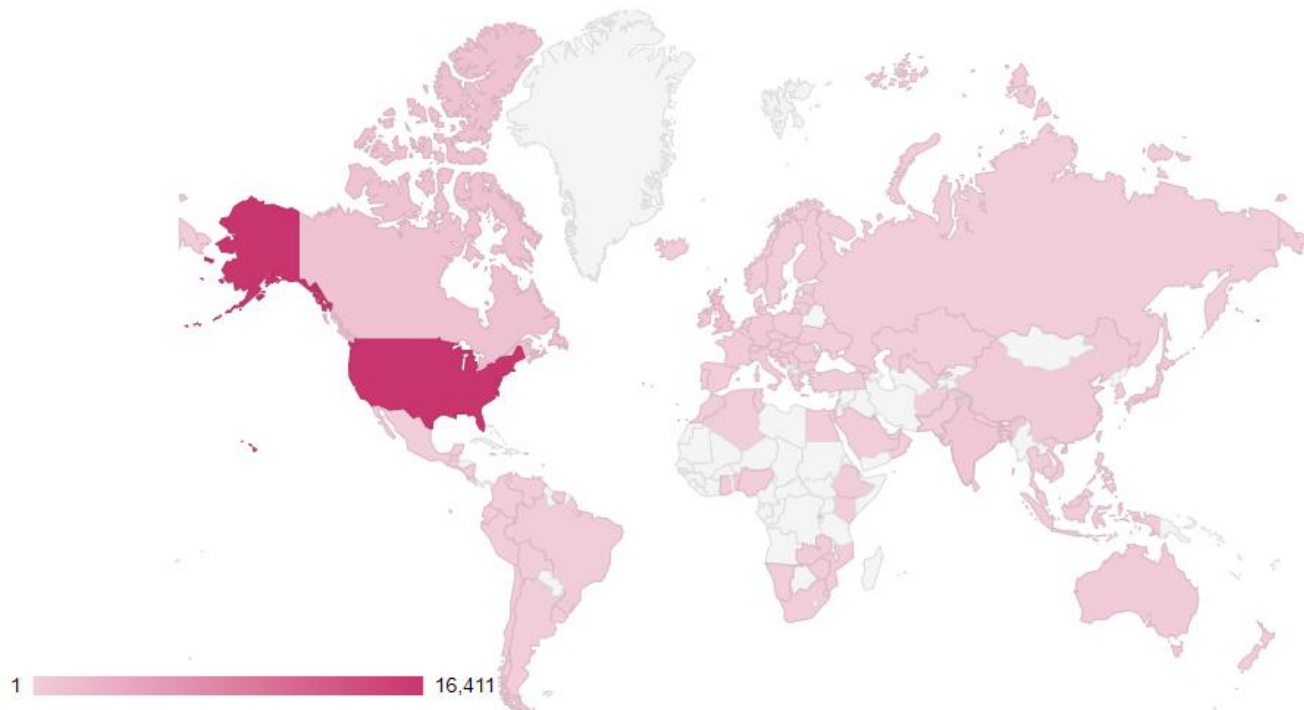


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# Impact: Readership



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# Readership survey



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# Readership survey: demographics

- All 23 identified as white
- Gender
  - 9 men
  - 9 women
  - 2 Female-adjacent/ gender non-conforming woman
  - 1 non-binary
  - 1 unknown



# Readership survey: background

Four-year college/university instructor/faculty (teaching focused)	8
High school teacher	5
Graduate student	3
Other	2
Postdoc	2
College/university staff	1
Four-year college/university instructor/faculty (research focused)	1
Two-year college instructor/faculty	1

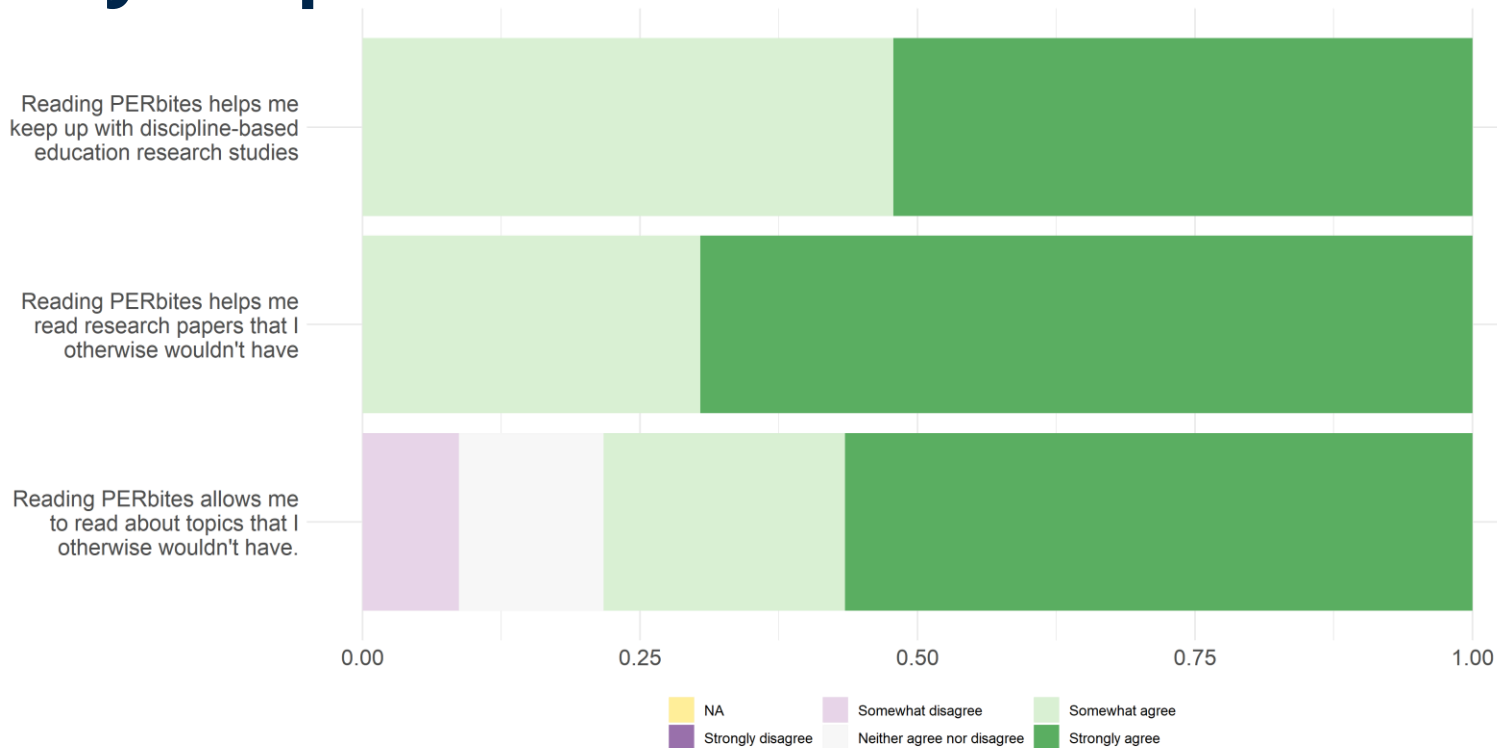


# Readership survey: background

Physics	12
Astronomy	7
Other	2
Education	1
Geoscience	1

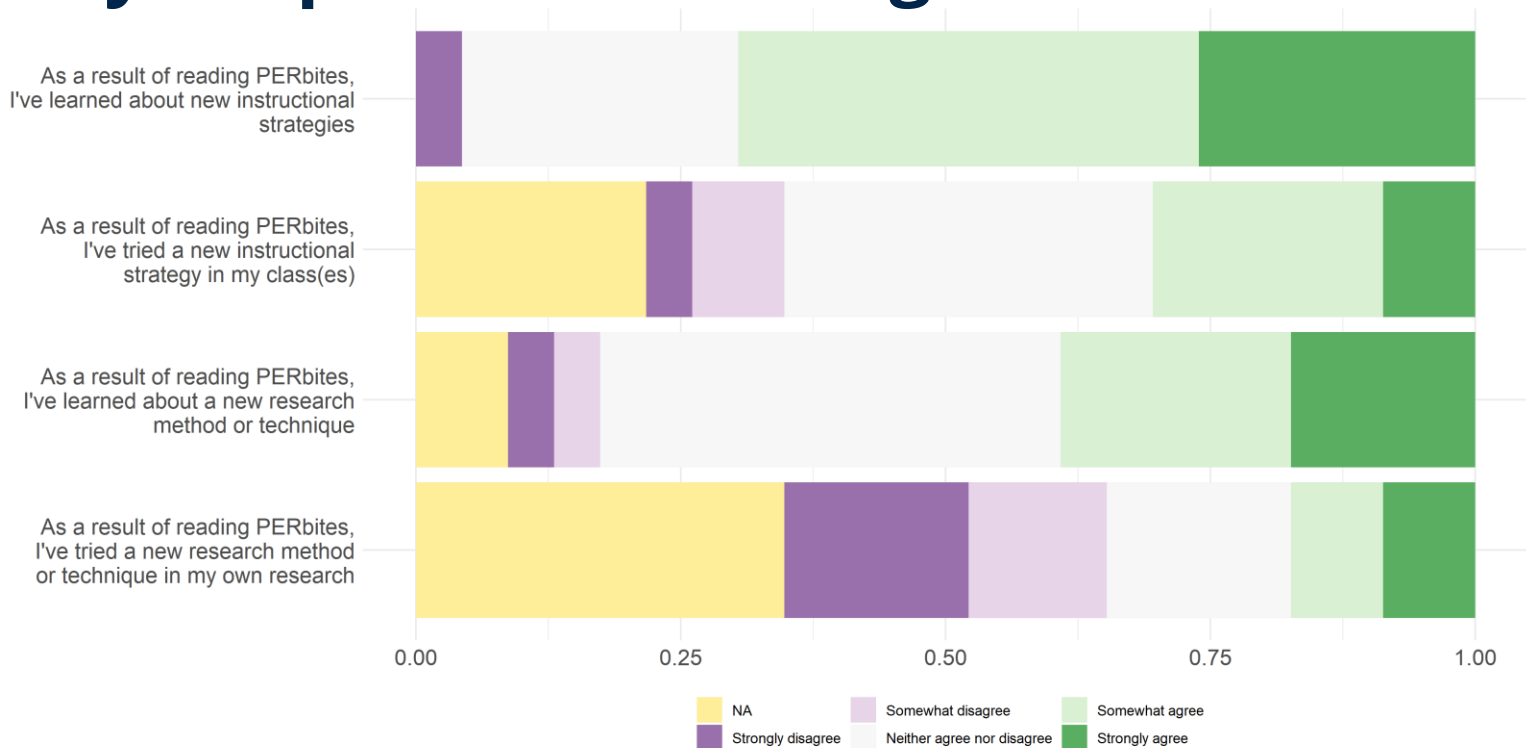


# Survey Responses: Goals around DBER

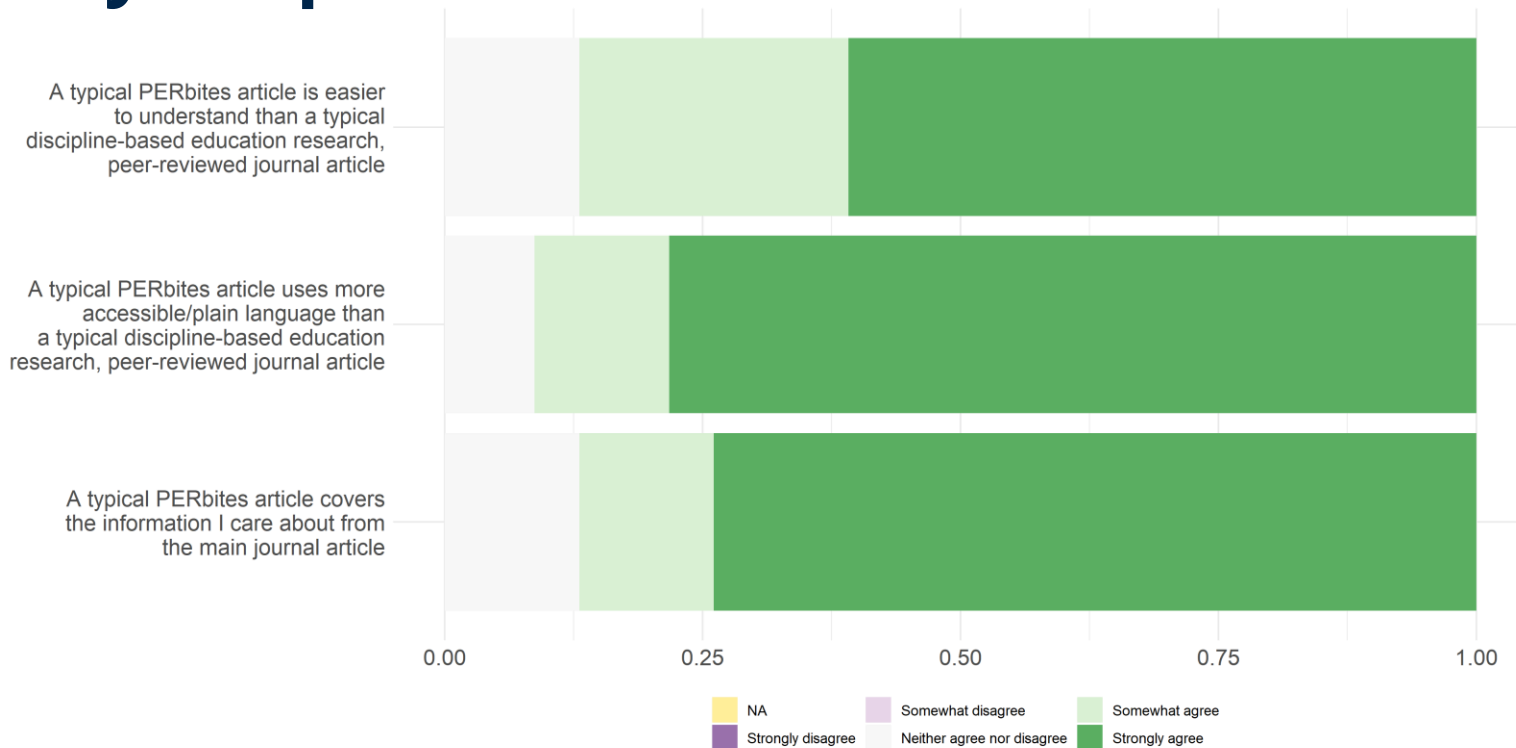




# Survey Responses: Teaching & Research



# Survey Responses: Goals around SciComm



# Trying it yourself



# Activity 1

- Grab a pen/paper, open notes app on phone/laptop, etc.



# Activity 1

- Grab a pen/paper, open notes app on phone/laptop, etc.
- Two minutes
- Write out an explanation of your current research at level of sophomore major in your discipline



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# 2 minutes



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# Activity 1: Part II

- Repeat but with 1 minute



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# 1 minute



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# Activity 1: Part III

- Repeat but with 30 seconds



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# 30 seconds



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# Activity 1: Half-Life your message (Aurbach 2018)



Commentary

**Half-Life Your Message:  
A Quick, Flexible Tool  
for Message Discovery**

Science Communication  
2018, Vol. 40(5) 669-677  
© The Author(s) 2018



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DOI: 10.1177/1075547018781917  
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**Elyse L. Aurbach<sup>1</sup>, Katherine E. Prater<sup>2</sup>,  
Brandon Patterson<sup>1</sup>, and Brian J. Zikmund-Fisher<sup>1</sup>**

**Abstract**  
Academic writers and presenters need concrete activities to help them learn how to communicate more effectively. We describe such a tool, called “Half-Life Your Message,” which is adapted from a commonly used improvisational theater game and can be applied in three minutes to distill a central thesis for any communication effort. Users can increase the value provided by Half-Life Your Message by scaffolding its application with an introduction and opportunity to self-reflect and debrief. We emphasize the tool’s utility based on our experiences in using it ourselves and in teaching it to undergraduates, graduate students, and faculty.

**Keywords**  
science communication, public engagement, messaging, idea prioritization

Effective communication is critical to information transfer and the ability to engage others in meaningful discussion. Every communication effort, from technical manuscripts to public engagement efforts, requires appropriate focus and framing to achieve the communication goal. Both academic and professional organizations are increasingly calling for access to training

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<sup>2</sup>University of Washington, Seattle, WA, USA

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<https://doi.org/10.1177%2F1075547018781917>

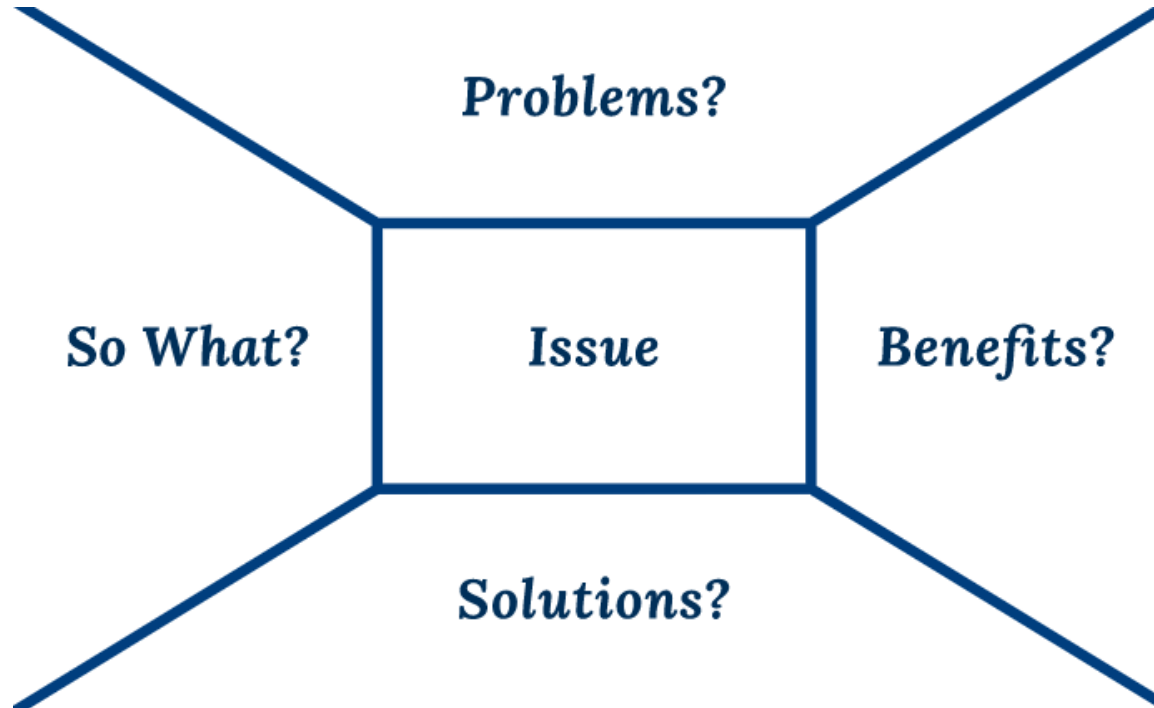


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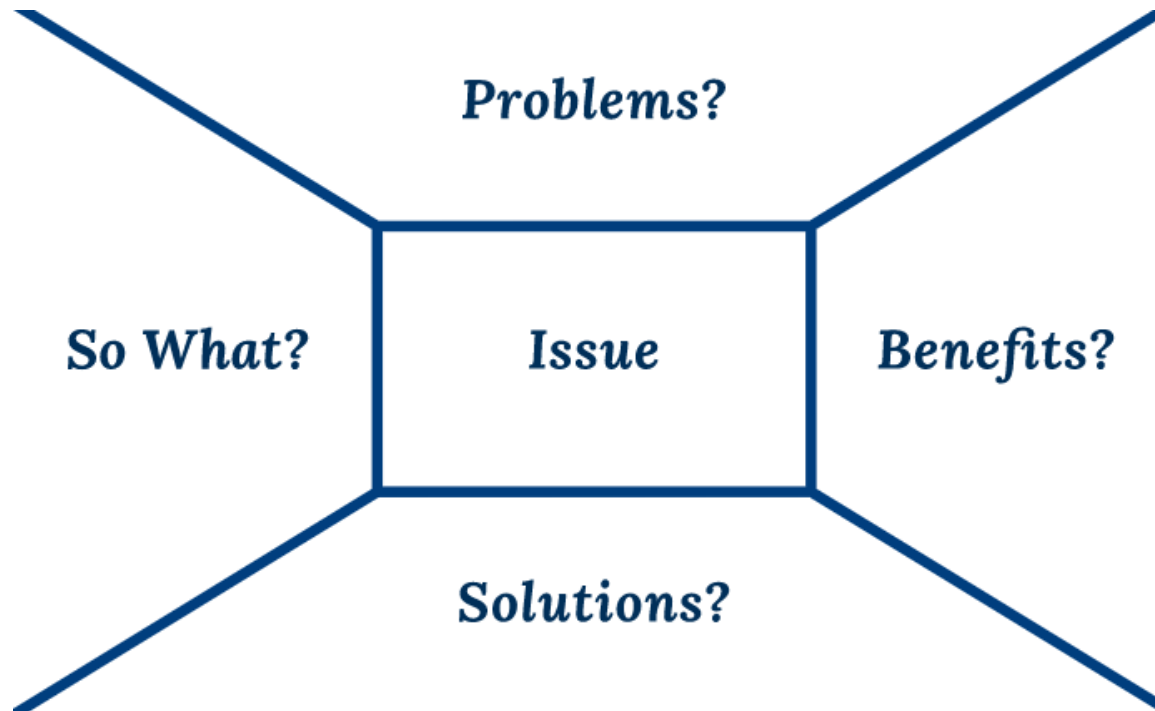


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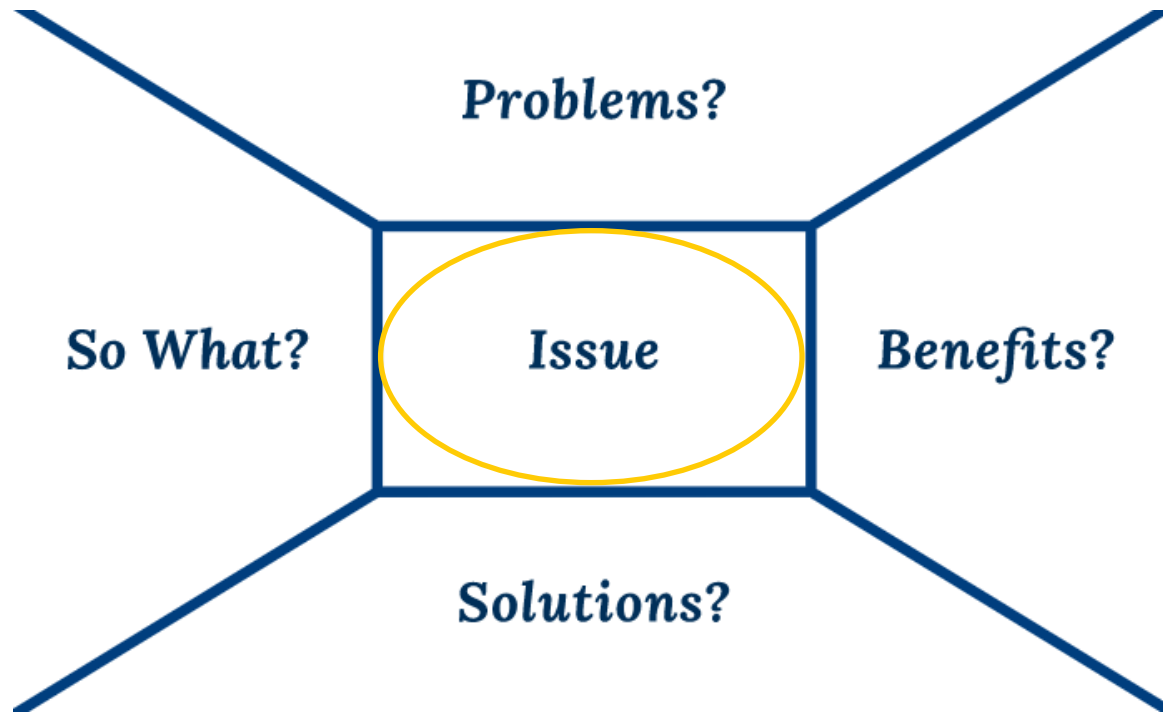
## Activity 2: Message Box (COMPASS)



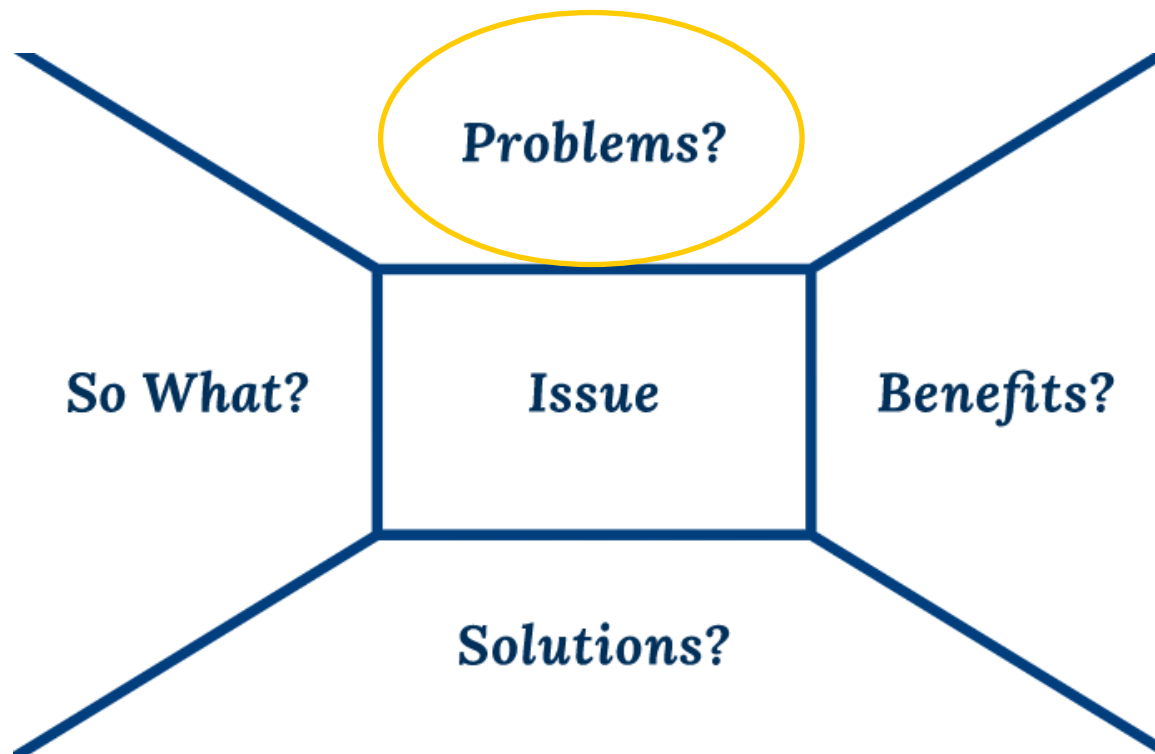
# Step 1: Define audience



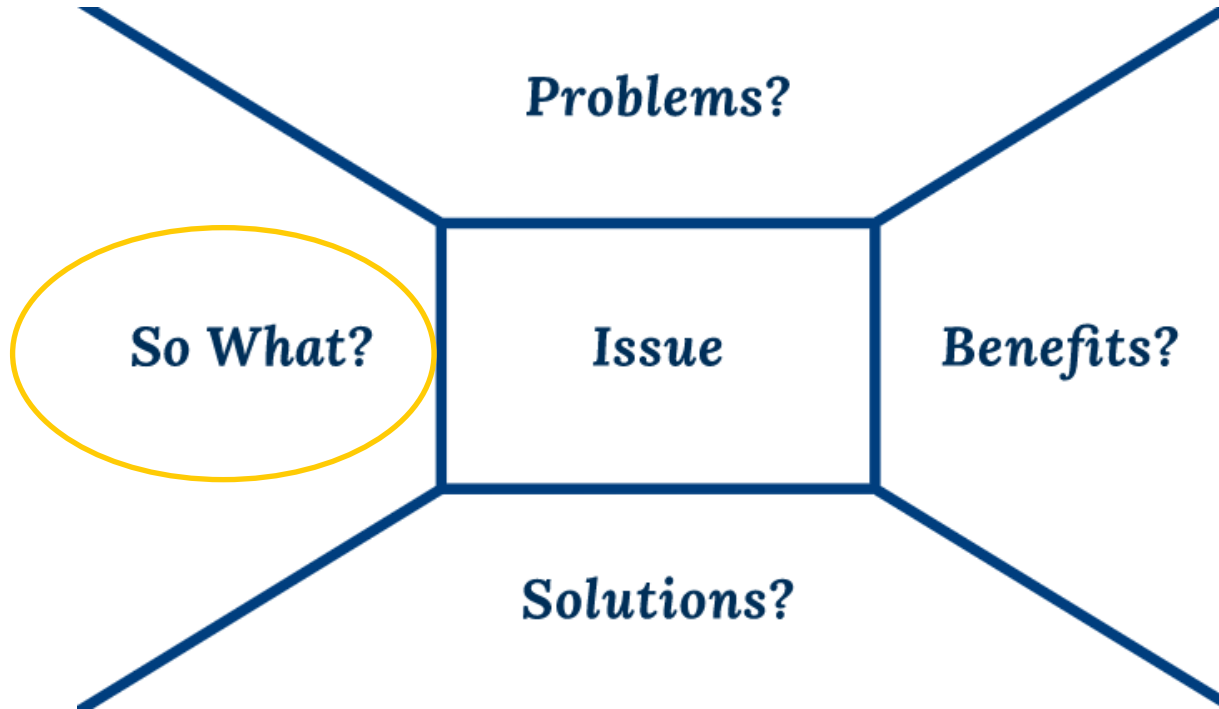
## Step 2: Issue



## Step 3: Problems

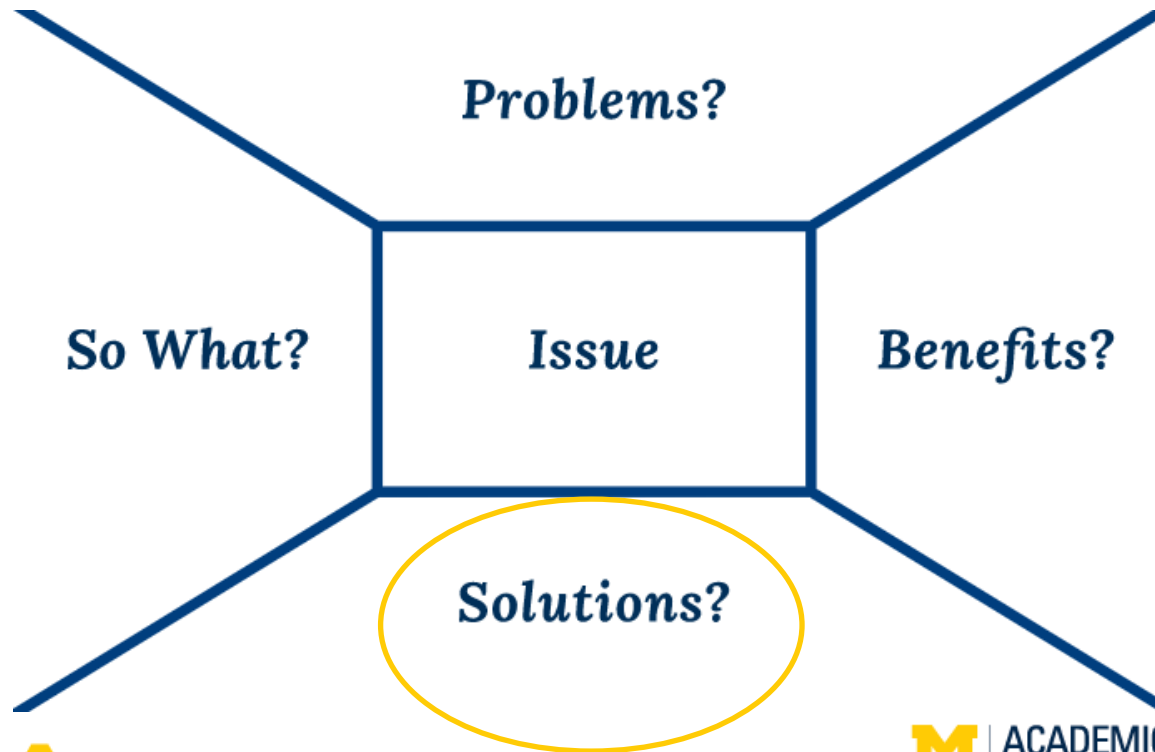


## Step 4: So what

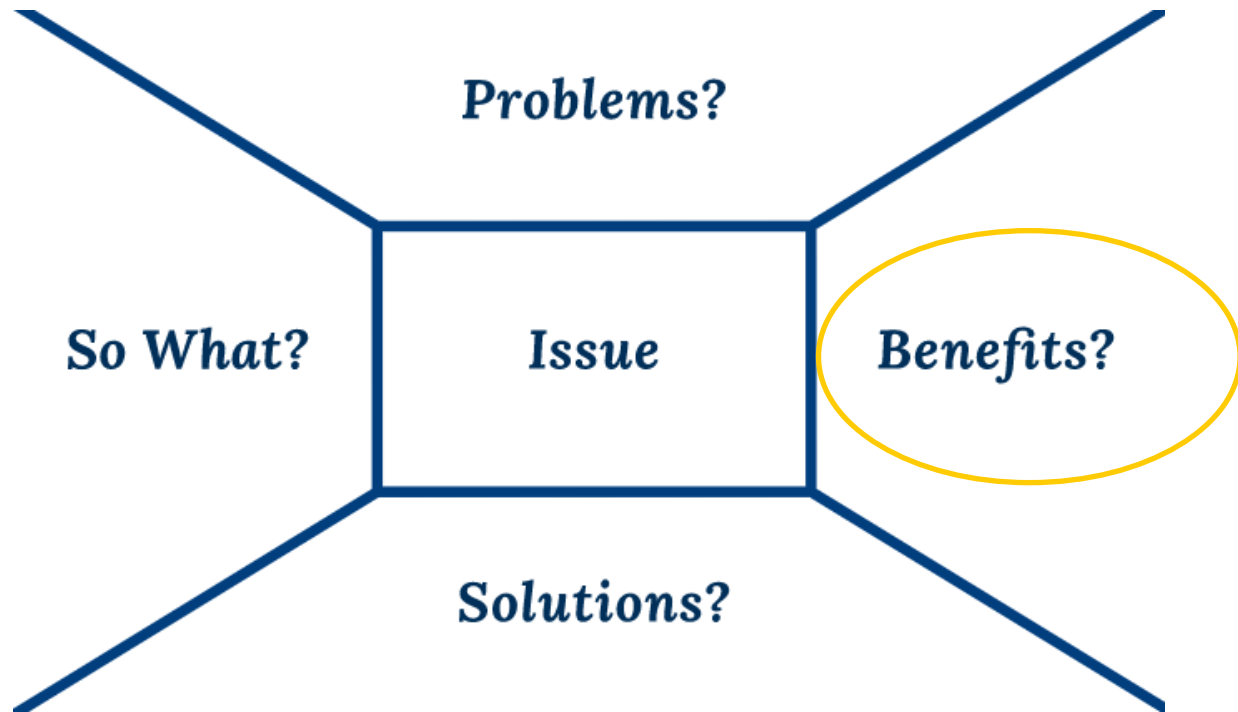




## Step 5: Solutions



## Step 6: Benefits



# Activity 2: Message Box

## The Message Box

What is the Message Box?

Get Started Using  
The Message Box Workbook

Download Your Own  
Message Box Workbook



What is the Message Box?

## A tool for crafting your message



The Message Box helps you take the information you hold in your head about your work and communicate it in a way that resonates with your chosen audience. It can help you prepare for interviews with journalists or employers, plan a presentation, outline papers or lectures, prepare grant proposals, or explain what you do and why it matters to family and friends. First, you identify your audience. Then you can move through the five sections of the Message Box in any order you choose. The most important thing is to just get started!

<https://www.compassccicomm.org/leadership-development/the-message-box/>

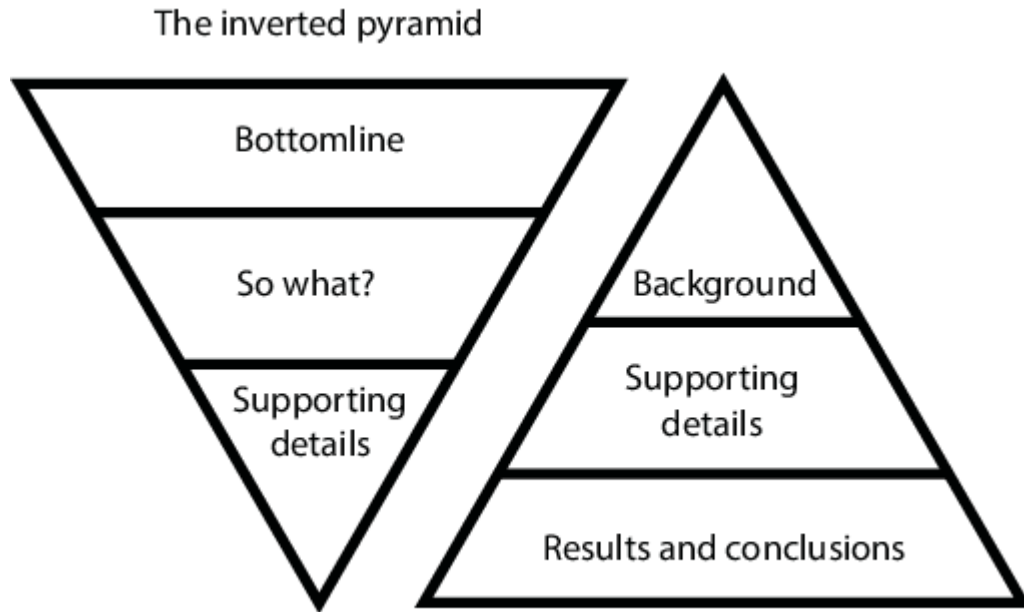


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# Activity 2b Inverted Pyramid

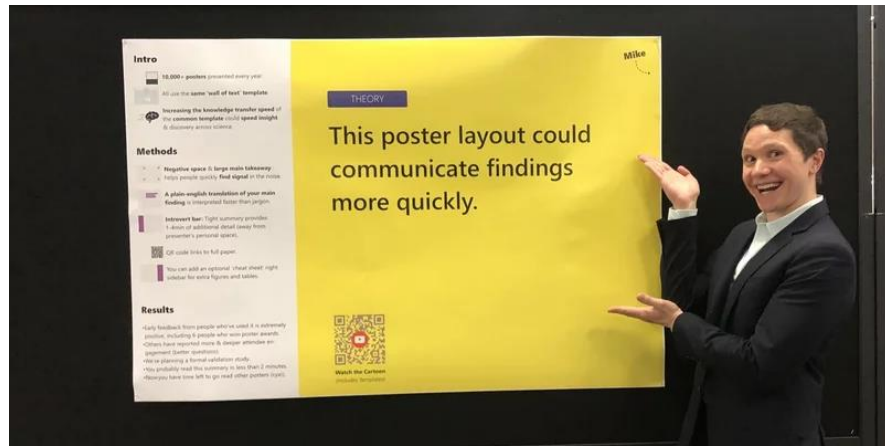


Usual communication by scientists

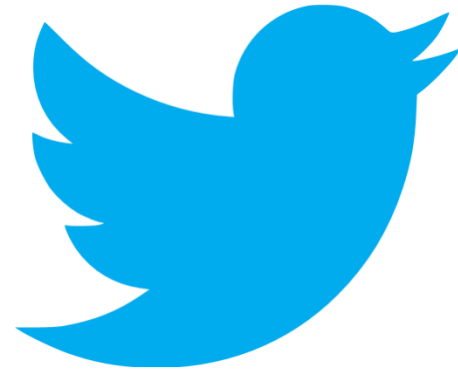
[Hut et al 2016](#); figure used under [CC BY 3.0](#)



# Activity 3: Twitter Posters (Morrison 2020)



Source: Mike Morrison



# Activity 3: Twitter Posters ([Morrison 2020](#))

## A Tweet-Packed Day for Poster Presenters

March 7, 2022 • Physics 15, 33

Researchers came together on Twitter for a 24-hour poster conference that allowed them to interact from opposite sides of the globe.



primas1/stock.adobe.com

For the seventh year, the Royal Society of Chemistry had a poster session on social media.

<https://physics.aps.org/articles/v15/33>



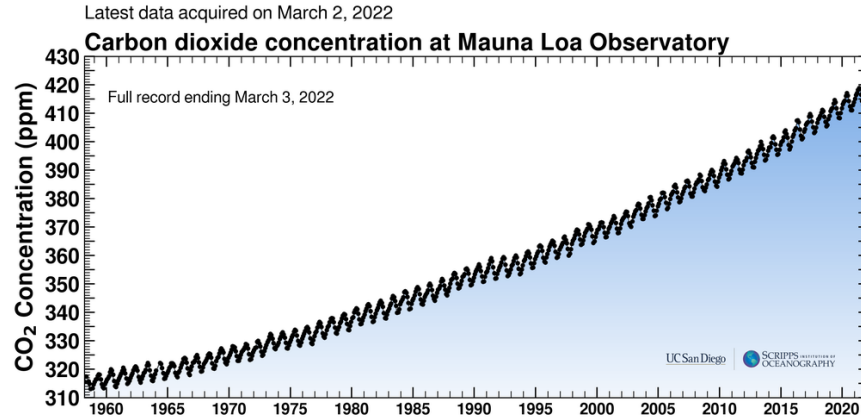
# Step 1: The takeaway

## Activity 1: Part III

- Repeat but with 30 seconds

## Step 2: Key figure

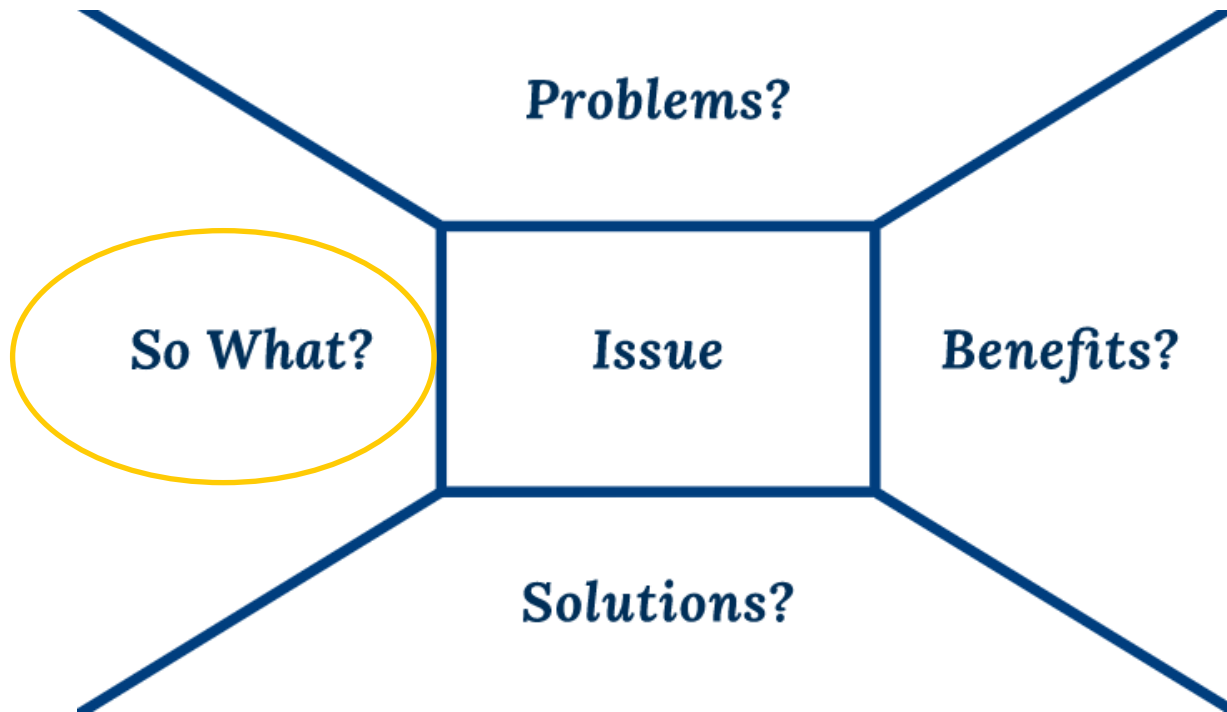
Carbon Dioxide has been increasing in the atmosphere over the past 6 decades



Source: [Scripps Institution of Oceanography](https://scrippsco2.ucsd.edu/)



## Step 3: Who cares



## Step 4: Explain the method in steps



## Activity 3: Twitter Posters ([Morrison 2020](#))



# Recap

- Being able to adapt your message to each audience is important



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- PERbites, as how I've interpreted that



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- Provided tools to assist you in your journey



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Additional Questions?  
Send to [ntyoung@umich.edu](mailto:ntyoung@umich.edu)

Hosting and support for PERbites provided by the American Astronomical Society



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# Extra Slides and Examples





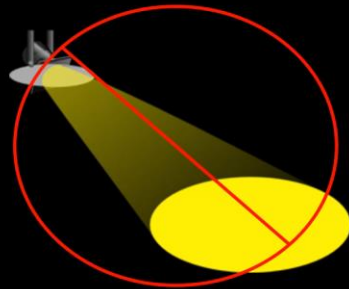
# PERbites links


- [www.perbites.org](https://www.perbites.org)
- [www.twitter.com/perbites](https://www.twitter.com/perbites)
- [www.facebook.com/perbites](https://www.facebook.com/perbites)



# Twitter Poster Example

The physics GRE does not  
help applicants stand out in  
the admissions process.



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5

<https://twitter.com/NickYoungPER/status/1316461357475270658>



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