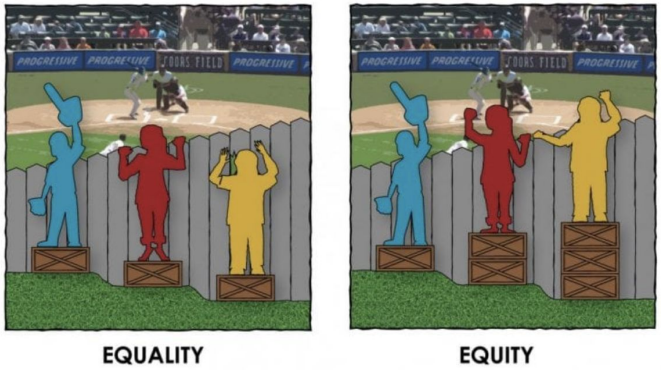
Inclusive Practices in Research

2021-04-14 MBP EDI Committee

Disparities in Science

- Equity: Fair treatment of all people
  Includes identification and elimination of unfair biases, stereotypes, or barriers
- Inequities exist across different groups in science - including but not limited to gender, race, disability, sexual orientation, socioeconomic status

- Goal of workshop: Identify ways to practice inclusion and equity as researchers



https://icytales.com/equity-vs-equality-which-of-the-2-is-best/

Disparities in Science

Gender

Global meta-analysis of relationship between gender and: research output (authorship on paper), collaboration (co-authorship), impact of published articles (citations)

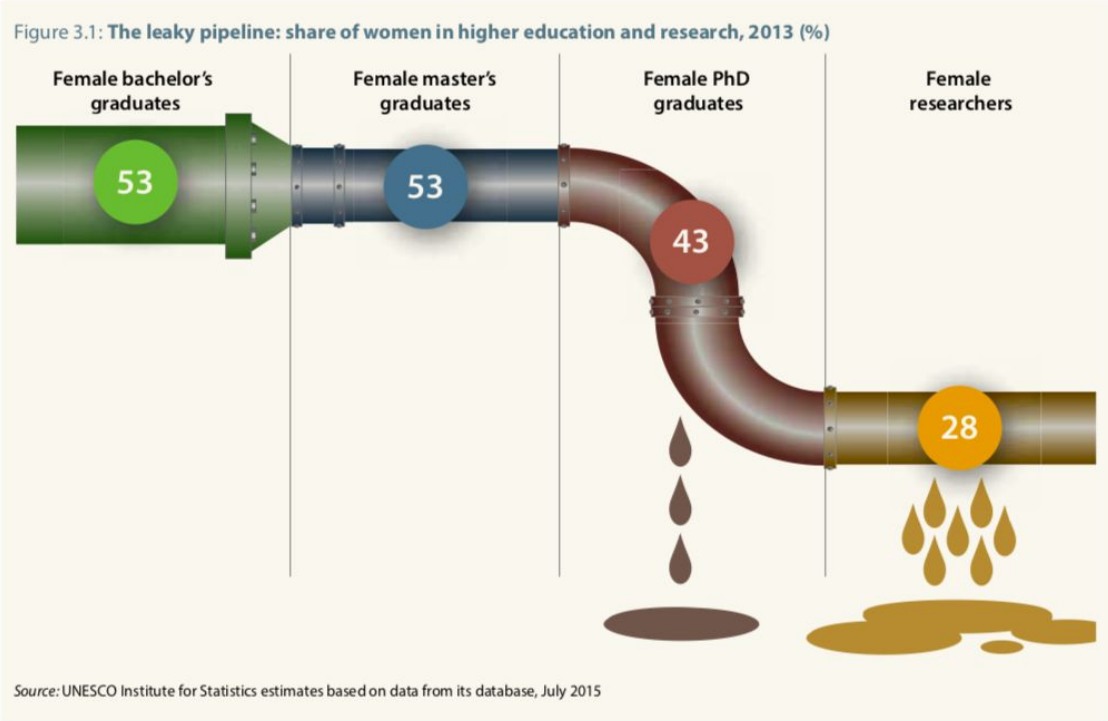
Findings:

- Women receive fewer citations and little international collaboration.
- Women receive 30% authorship globally
- Female authorship is more prevalent in countries with lower scientific output
- Countries with greater productivity (>1000 papers) are male dominated
- Female collaborations are more domestic
- Papers with women as first, last, and/or sole authorship receive less citations

Larivière, V., et al. *Nature* (2013).

Disparities in Science

Gender



Huyer, Sophia. (2018). Is the Gender Gap Narrowing in Science and Engineering?.

Disparities in Science

Race

- Black, Indigenous, and people of colour (BIPOC) researchers less likely to secure federal funding than white faculty
- Fewer culturally sensitive mentors
- 1/3 male and >1/2 female BIPOC faculty and students report experience stress due to discrimination
- Discrimination associated with higher turnover rate for BIPOC faculty

Clark, S., & Hurd, Y. *Nature Human Behaviour* (2020)

Disparities in Science

Race

Study using data from NIH grant data system (2000-2006)
Type 1 R01 (investigator-initiated research project grants):

- Applications from Asian, Black, Hispanic investigators = 21% of total research grant opportunities
- Compared to white investigators, Black investigators 13.2% less likely to be awarded, Asian investigators 3.9% less likely

Model controlled for demographics, education and training, employer characteristics, NIH experience, and research productivity

Ginther, D., Schaffer, et al. *Science* (2011)

Disparities in Science

Disability

- Disabilities include:
  Visual (blindness, low-vision, colour-blindness)
  Motor (slow response time, limited fine motor control, physical impairments)
  Cognitive (learning disability, distractibility, inability to remember/focus)
  Auditory (deafness or hard-of-hearing)
- Limited research to consider disparities in STEM for people with disabilities
- Undergrad: 11% of student population has disability, 8% successfully attain bachelor's
- ~4.8% of students in graduate science and engineering fields in the US identified having a disability

Wells, R. & Kommers, S. *International Journal of Disability, Development and Education* (2020).

Inclusive Research Design

Inclusive Research Design

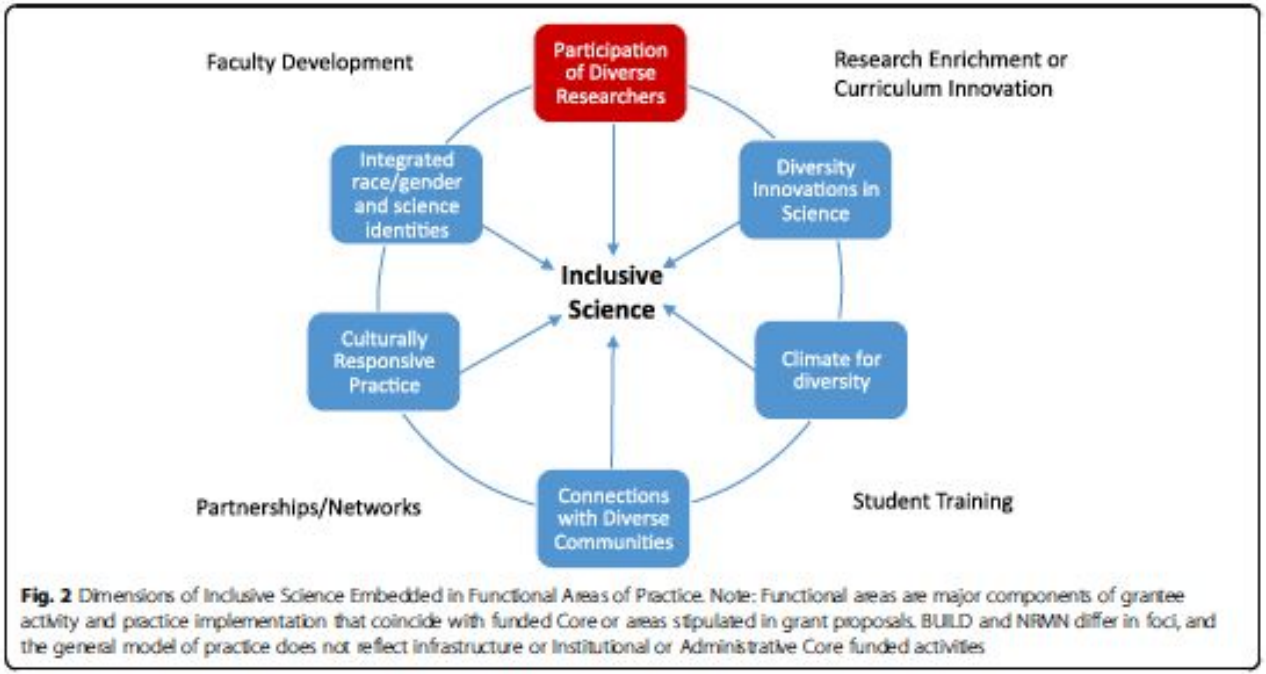


Fig. 2 Dimensions of Inclusive Science Embedded in Functional Areas of Practice. Note: Functional areas are major components of grantee activity and practice implementation that coincide with funded Core or areas stipulated in grant proposals. BUILD and NRMN differ in foci, and the general model of practice does not reflect infrastructure or Institutional or Administrative Core funded activities

Hurtado, S., White-Lewis, D., & Norris, K. *BMC Proceedings* (2017).

Inclusive Research Design

Participation of diverse researchers

- Provide opportunities for comprehensive support to individuals who may not have access to research mentors

Diversity innovations in science

- Address topics and issues involving discovery and advancing knowledge of diverse communities
- For example:
  New research questions addressing issues impacting specific demographic groups
  New methodologies for research involving marginalized population

Hurtado, S., White-Lewis, D., & Norris, K. *BMC Proceedings* (2017).

Inclusive Research Design

Climate for diversity

- Improving the climate in classrooms, labs, and interactions on campus
- Example: Educating faculty about marginalization and microaggressions

Partnerships with diverse communities

- Direct contact with diverse communities that have been overlooked in data or programs, marginalized due to location or lack of opportunity

Hurtado, S., White-Lewis, D., & Norris, K. *BMC Proceedings* (2017).

Inclusive Research Design

Culturally responsive practice

- Teaching practices that embrace whole student in the learning process
- Mentors should recognize their own and mentee's cultural identity and worldview

Integrated science identities

- Encourage participants' identities as aspiring scientists/researchers with their social identities
  -> Research on women of colour in STEM has led to development of a science identity model shaped by race and gender
- Evaluation regarding science identity and how it may vary across time or career stage

Hurtado, S., White-Lewis, D., & Norris, K. *BMC Proceedings* (2017).

Inclusive Research Design

Data Analysis

1. **Disaggregate data:**
- Identify characteristics within data
    - Example: Racial identity, gender identity, disability, etc
- Examine intersection of characteristics

2. **Pay attention to small populations:**
- Strategic data collection
- Multiple cohorts from small populations
- Triangulate findings with other forms of data

NSSE - Support & Resources for Institutional Improvement - Tips for More Inclusive Data Sharing and Analysis.

Inclusive Research Design

Data Analysis

3. **Consider your framework:**

- Discussion/presentation of findings
- Explore relationships between variables/results

4. **Rethink comparisons and reference groups**

- What is being considered normal/baseline?
- Using majority as reference may not reflect how minority groups compare against each other

NSSE - Support & Resources for Institutional Improvement - Tips for More Inclusive Data Sharing and Analysis.

Inclusive Scientific Communication

What is inclusive scientific communication (ISC)?

Intentional and reflective approach:

- Recognizes historical oppressions, discriminations, and inequities - centres voices, knowledge, and experiences of marginalized individuals and communities in STEM
- Acknowledges that each person's individual characteristics, such as gender, race, physical ability, overlap with each other (intersectionality), overlapping identities impact status
- Acknowledges explicit and implicit biases (historical, cultural, experiential) of practitioners/scholars that influence design & implementation of their work
- Incorporates methods that respect and value the ideas and experiences that diverse people bring to conversations about STEM
- Uses multi-scale approach to dismantle and rebuild systemic issues of inequitable access and engagement with STEM

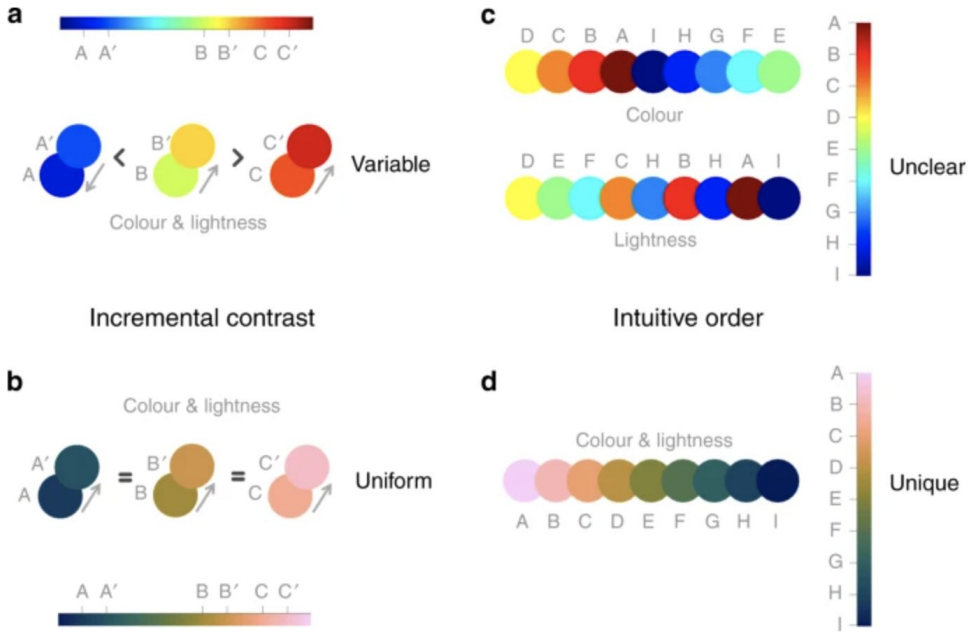
Canfield, K. & et al. *Frontiers in Communication* (2020).

Data representation

Colour maps

- Many colour maps (rainbow, red-green) visually distort data
- Unreadable to individuals with impaired colour vision

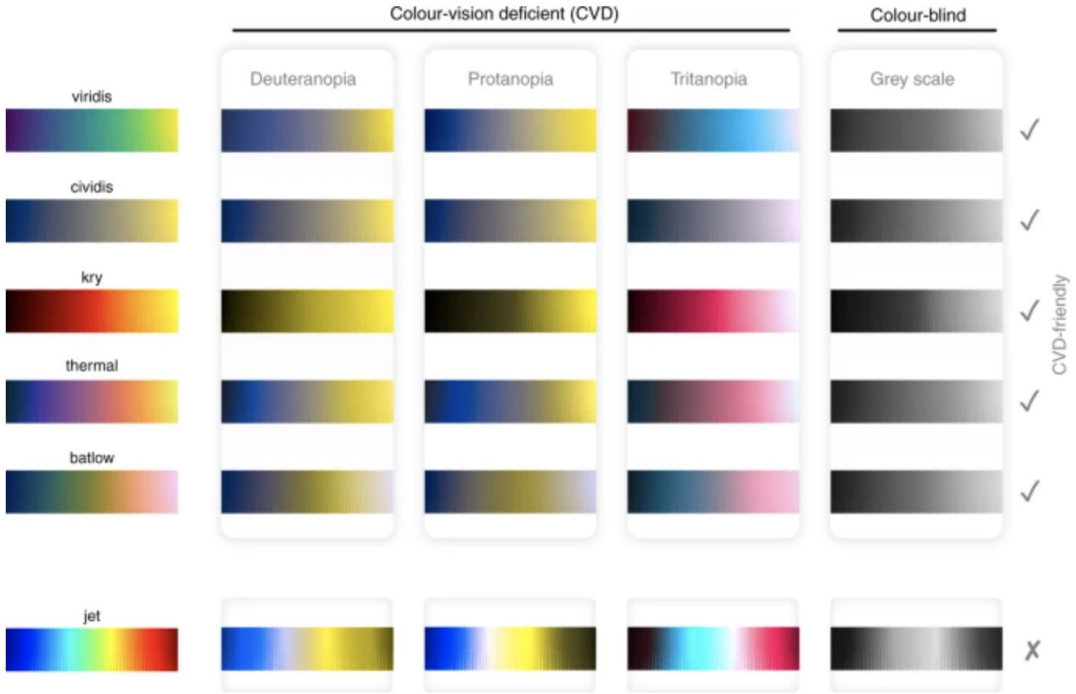
- Many accessible options:
  Colorbrewer
  MPL (Matplotlib)
  Cividis
  CMOcean
  CET (Centre for Exploration Targeting)



Crameri, F., Shephard, G. & Heron, P. *Nature Communications* (2020).

Data representation

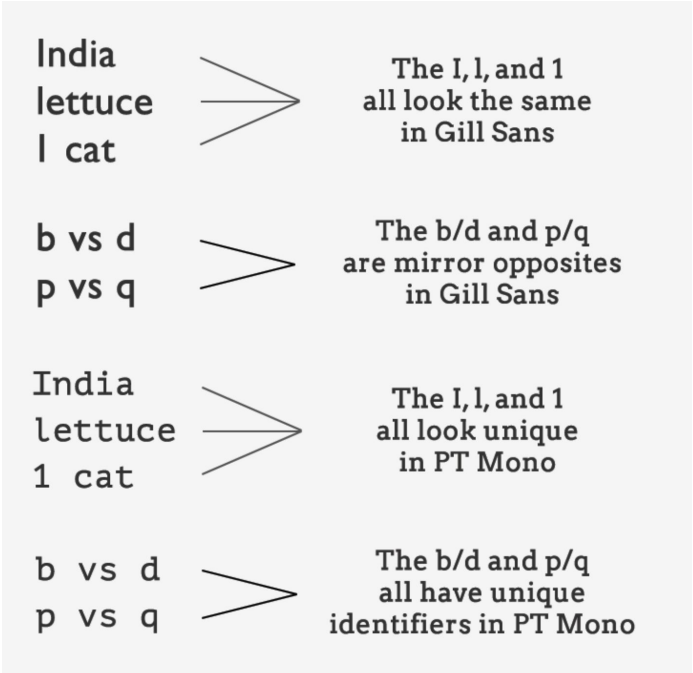
Colour maps



Crameri, F., Shephard, G. & Heron, P. *Nature Communications* (2020).

Data representation

Font



Choosing accessible typeface:

- Difference between I,l, and 1
- Compare letters b and d, p and q: mirror images or distinguished
- Compare letters g, a, and o - are they distinguished?
- Do the letters rn look like the letter m?

Presentations

Before the presentation:

- Be aware of potential disabilities
- Ask speakers/attendees before presentation regarding any disabilities/accommodations if possible (ex. Seating people with poor vision in front row to better see screen, breaks between presentations, etc)
- Ensure facility is accessible (access to room and surrounding bathrooms), with good visibility of speakers

In slides:

- Make text and important visuals big enough to be read e from the back of the room, use an easy-to-read font face (consider thickness, easy-to-read font)
- Use sufficient contrast between colours (contrast guidance and evaluation tools)
- Consider whether motion or animation is necessary

How to make your presentations accessible to all.
https://www.w3.org/WAI/teach-advocate/accessible-presentations/

Presentations

During the presentation:

- Use interpreters and captioners as needed
- Speak clearly, not too fast, use microphone if needed
- Use simple language, avoid acronyms and idioms (ex. “raising the bar”)
- Give people time to process information, be visible, describe graphics, videos, and other visuals
- Describe other visual information (i.e. if you ask people to raise their hand for something, describe how many people raised their hand)

How to make your presentations accessible to all.
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Presentations

After the presentation:

- Offer handouts, slides, and other material in accessible format ex. large print or braille, or send electronically
- Provide recordings of sessions afterwards
- Output text transcript of presentation for reading/translation into other languages

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Web Design

- Web Content Accessibility Guidelines (WCAG) provides international set of guidelines

- There are four principles, coined **POUR**

  Perceivable: Available to the senses (vision/hearing primarily) either through the browser or through assistive technologies (e.g. screen readers, screen enlargers, etc.)

  Operable: Users can interact with controls and interactive elements using the mouse, keyboard, or an assistive device

  Understandable: Content is clear and limits confusion and ambiguity

  Robust: A wide range of technologies (including old and new user agents and assistive technologies) can access the content

Web Design

Principles of accessible design

- Provide equivalent alternative text: textual alternative to non-text content in web pages
- Create logical document structure: headings/lists provide meaning&structure
- Ensure users can complete and submit all forms (text field, checkbox, dropdown list) and recover from errors
- Write links that make sense out of context, avoid phrases like "click here”
- Caption and/or provide transcripts for media
- Do not rely on color alone - can be used to enhance comprehension. Information must be available to a person who is color blind
- Write clearly, use clear fonts, and use headings and lists logically

Web Design

List of resources available to enhance accessibility:

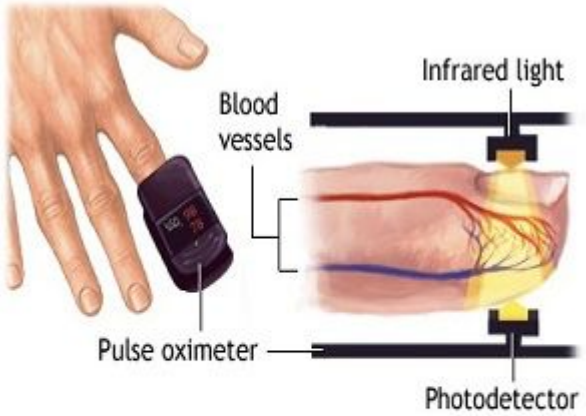
https://uwaterloo.ca/web-resources/resources/accessibility/tools

Breakout Rooms

Scenario 1

Oxygen is often administered as a medical therapy and is commonly adjusted using a pulse oximeter device that measures oxygen saturation.

Recent study in the New England Journal of Medicine has demonstrated that pulse oximeter technology may be racially biased against individuals with darker skin pigmentation. Researchers determined that patients with darker pigmentation had nearly three times the frequency of occult hypoxemia that was not detected by pulse oximetry as those with lighter pigmentation. Given that consumer wearables are being increasingly used to track health-related outcomes, ensuring that this technology is free of bias is of major importance. What are some ways in which engineers could have avoided this racial bias when developing pulse oximeter technology?



A pulse oximeter estimates the amount of oxygen carried in the bloodstream using infrared technology across the skin

Scenario 2

In 2020, Malone Mukwende published Mind the Gap: A handbook of clinical signs in Black and Brown skin in order to represent how symptoms of various conditions can present on darker skin tones, as many medical textbooks and websites predominantly referenced white skin. What is the significance of this work? What are the problems associated with only presenting how disease is expressed in one demographic?

Scenario 3

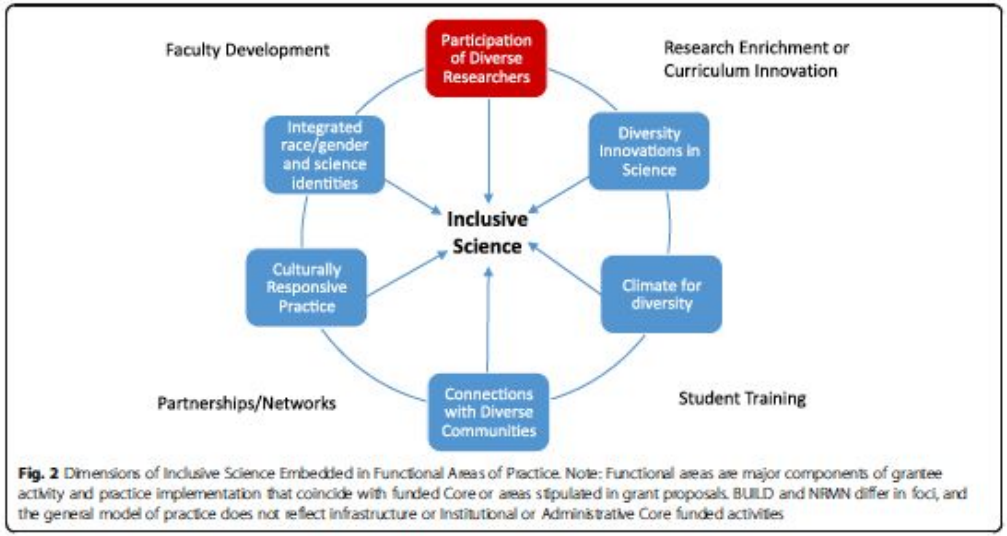
Jamie is a graduate student whose university has been selected to host a national conference in their field. Jamie volunteers as part of the planning committee to organize logistics (physical space, technology/presentation, reception) and wants to ensure inclusivity throughout the conference. What are some ways this might be implemented?

Scenario 4

Not all disabilities are immediately apparent - those that are not noticeable through observation are termed “invisible disabilities”. What are some examples of invisible disabilities, and how might people with invisible disabilities be overlooked when considering accommodations?

Scenario 5

The following framework has been suggested as a holistic model for practicing inclusive science. In what ways has your department implemented aspects of this framework? Are there any areas you think your department could improve upon?



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Scenario 6

Marco is giving a committee meeting presentation to present his thesis progress in a few months. One of his committee members has disclosed that they have a visual impairment. What are some things Marco can do before, during, and after the committee meeting to ensure he is being considerate of all members?