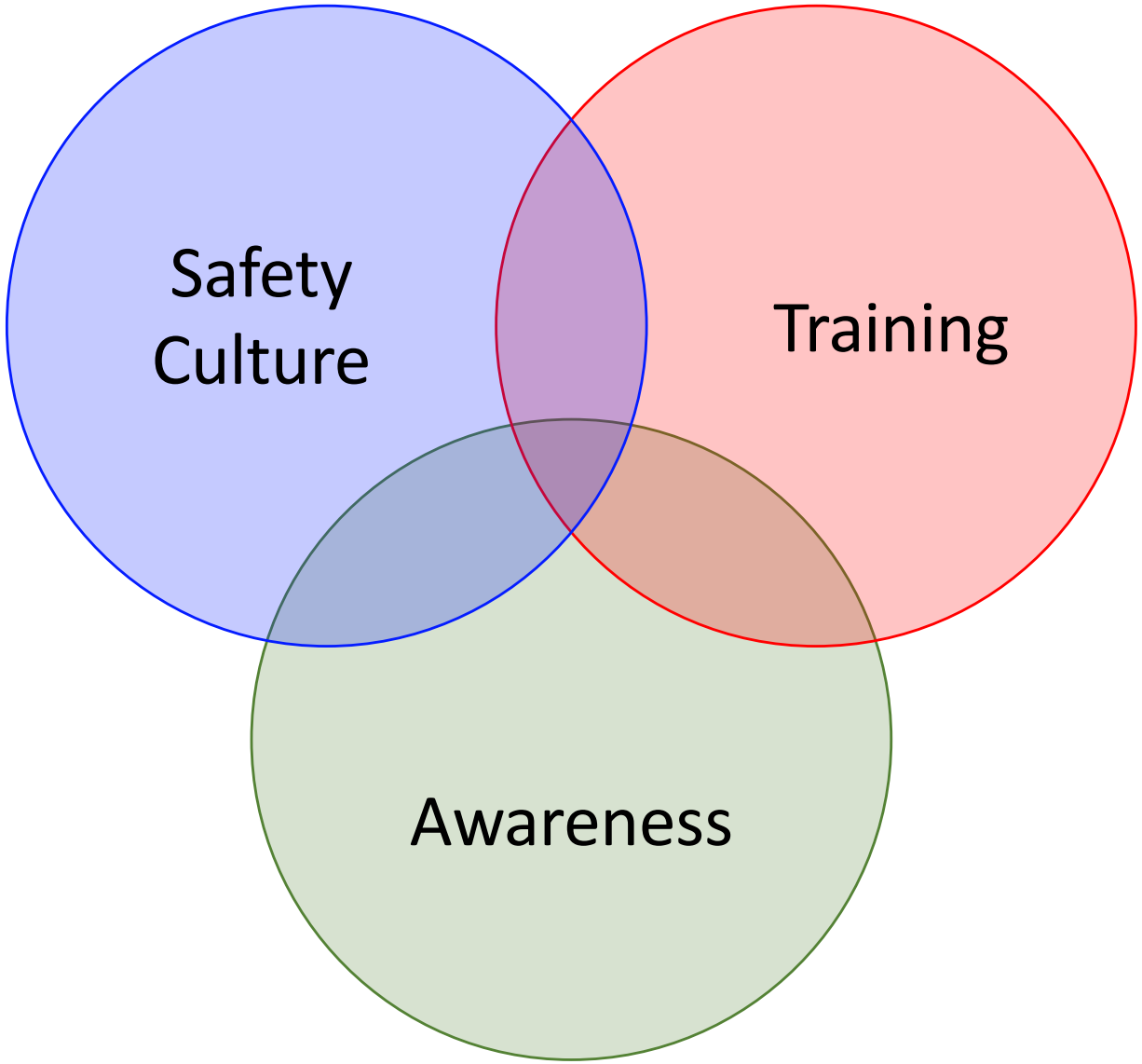
The Three Pillars of Lab Safety



Repository of Safety Initiatives

Table 2 Resources for safety culture.

#	*Resource title*	*Details, how to use, and how to access*
1	National Reports on Safety Culture	Major reports that call for improved academic laboratory safety culture How to use: Review the key recommendations and consider how to improve group or departmental safety culture Access: 1. Prudent Practices in the Laboratory—https://www.nap.edu/catalog/12654/prudent-practices-in-the-laboratory-handling-and-management-of-chemical 2. Guidelines for Chemical Laboratory Safety in Academic Institutions—https://www.acs.org/content/dam/acsorg/about/

Table 3 Resources for training.

#	*Resource title*	*Details, how to use, and how to access*
1	Departmental Training	Resources used to train researchers at the departmental level about safety and risk assessment. Four articles from the literature are presented as entry points for learning about departmental training How to use: These peer-reviewed articles outline strategies various institutions have taken to improve safety training at a departmental level Access: 1. Development of an Undergraduate Course in Chemical Laboratory Safety through an Academic/Industrial Collaboration— https://doi.org/10.1021/acs.jchemed.7b00599 2. Introduction to Laboratory Safety for Graduate Students: An Active Learning Endeavor—https://doi.org/10.1021/acs

Table 4 Resources for awareness.

#	*Resource title*	*Details, how to use, and how to access*
1	Safe Operating Cards (SOCs)	A risk assessment tool that includes detailed reaction information, associated hazards, and emergency shutdown. The Safety Net, UMN JST, and Dow all provide templates How to use: Customize hazards/template as needed before printing and laminating. Fill out using wet erase and attach to hood sash in front of ongoing reactions Access: 1. The Safety Net SOCs—http://safetynet.web.unc.edu/home/lab-resources/socs/ 2. JST at UMN SOCs—http://www.jst.umn.edu/resources/labeling-samples

Setting Core Values and Leading by Example

1. Leadership
    - Mission statements can feel like “lip-service”; more impactful if there is follow through
    - *“what is important to the professor becomes important to the student”*
    - *“I have always noticed that our students immediately reflect, pick up on, and look for what they think their professors deem most necessary/important essential”*
2. Accountability
    - Make safety a part of regular discussions
        - *“These are the conversations that help make safety a part of doing work, not just something bolted on to check a box”*
    - Follow-up discussions are important to ensure proper implementation
        - *“Can't be a one-and-done although it often feels like it is treated that way”*

Setting Core Values and Leading by Example

1. What does it mean for a faculty member to not just pay “lip service” and what would motivate faculty to make this change?
2. How to start holding researchers accountable without creating a feeling of “policing” or “gotcha”?

Empowering Researchers

1. Lab Safety Officers
    - *“We've seen dramatic improvement in safety issue resolution once we implemented this kind of program.”*
    - *“Depending on how this work is distributed, it can become an incredibly time-consuming set of tasks for one person to constantly be handling”*
2. Collectively develop policies; e.g. SOPs
    - Researchers should have a hand in writing and editing all pertinent safety materials for their labs
    - *“I have struggled with how to get buy-in for production of written SOPs.”*
    - *“It also increases the likelihood that the researchers will be able to implement the controls!”*

Empowering Researchers

1. How can LSOs be leveraged to their maximum potential without being burdensome?
2. SOPs can be a useful tool in setting safety policy, but when are they not useful? What alternative solutions may play a similar role?

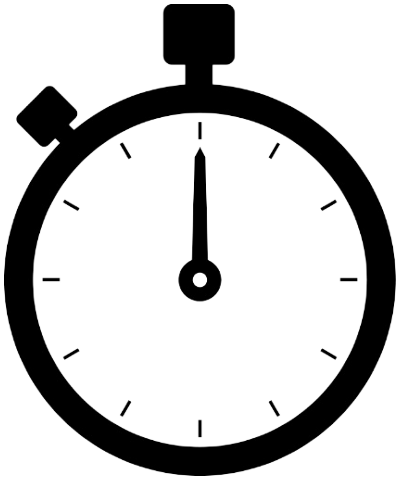
Effective Training

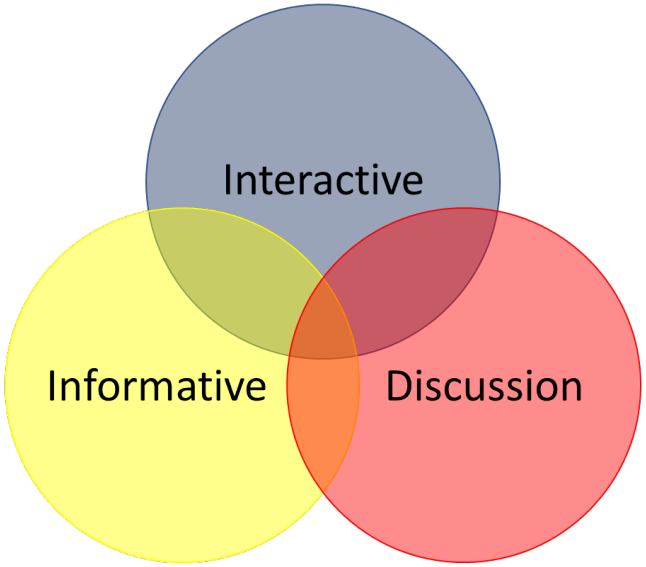
1. Initial Training
    - University-wide lab safety manuals are not particularly useful at the individual/lab level
    - Hands-on training at the departmental and lower level is key to setting initial expectations
2. Continued Training
    - Continued reinforcement is important to maintain good habits, fight complacency, and correct arising bad behaviors
    - Also arises when serving as a mentor to younger researchers and teaching them how to perform experiments in the lab, safely
    - *“a mentee ending up with a mentor who doesn't emphasize safety in their work might be communicating that to their mentees as well”*
    - *“Gaps in senior leadership can develop in a group, leaving mentorship voids or leading to knowledge transfer losses. Like the game “telephone” where one person whispers a message to another in a chain, it is easy for the starting message to change gradually with each transfer of knowledge.*

Effective Training

1. How can we ensure that senior student mentorship is of high quality and recognizes the importance of passing on safety knowledge?

Safety Minutes/Moments: Miller Lab Edition





- A Safety Minute is a 10-20 minute interactive discussion on a topic presented by a researcher at group meeting
- Can relate to a recent lab accident, a technique or procedure, a SOP, or hazard assessment

Safety Minutes/Moments: Scenario/roleplaying

Prompt: You are sitting at your desk in lab when your eyes start to sting and tear up. What do you do?

- Interactive:
  - Prompt requires the researcher to create a plan of action
- Discussion:
  - Researchers will discuss what the best course of action(s) are
- Informative:
  - Students now have a plan for this unexpected lab emergency

Checklists

- A good checklist…
  - Provides immediate, visual reminders of appropriate actions in the case of emergency
  - *"does not replace in-person training and SOPs, but instead capture the most important aspects that can cause problems"*
  - Is made by the researchers and is for **their** work; it is not borrowed
- A bad checklist…
  - *"I see many students look at these checklist and ignore hazards because it is not on or part of the list."*
  - Fosters complacency:
    - *"…checklist fatigue - a repeated user thinks they know it and doesn't bother with the checklist."*
    - *"I see many students look at these checklist and ignore hazards because it is not on or part of the list."*

Checklists

1. How can we develop useful checklists while avoiding pitfalls? Think “design principles” or “best practices”
2. For what situations are checklists appropriate? For example, a non-life threating medical emergency vs. a routine lab task such as changing a gas cylinder