Keene STATE COLLEGE

Wisdom to make a difference.

(Modelling) Indicators of Success in a Lab Safety Culture

Ralph Stuart, CIH, CCHO
Environmental Safety Manager
Chemical Hygiene Officer
Keene State College

August 22, 2022

Today's Abstract

The term *"safety culture"* has a split personality.
It can refer to:
- A safety management tool
or
- The social context for risk decisions made by individuals and groups.

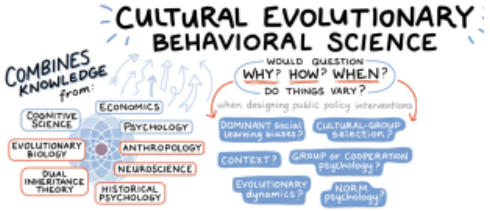
Hypothesis: It seems likely that people working in an evolving safety culture will benefit from identifying objective indicators that describe how the safety culture of a group changes over time.

This presentation will explore 4 ways to approach this opportunity.

March abstract

Wikipedia's illustration of "safety culture"

Today's presentation



"Cultural Evolutionary Behavioral Science in Public Policy" chapter in the Oxford Handbook for Cultural Evolution

My Safety Management Education

In 1986, I was handed the UVM Hazardous Waste Program to manage as an "other duty as assigned" (along with hazcom, safety training, IAQ, etc.). The assignment was to establish “good faith” compliance with relevant regulations. The institution’s goal was to avoid becoming a *Potentially Responsible Party* at a Superfund site.

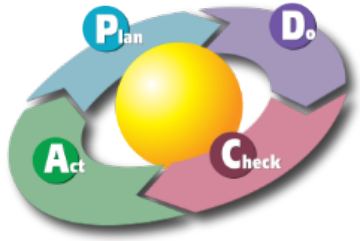
Over the next 7 years, this "good faith" approach resulted in 3 citations from the state of Vermont of increasing severity, leading to construction of a $2.2 million TSDF and the addition of 3 staff members (doubling the EHS staff at UVM)

In 1995, after a string of RCRA citations in higher ed, EPA New England asked the sector to “reinvent” a regulation for lab chemical waste, based on *Environmental Management System* theory. This project was enabled by the Project XL regulatory reinvention program and dubbed Lab-XL. The EMS approach uses the "Plan Do Check Act" cycle to support continuous improvement.

UVM joined with Boston College and UMass Boston to take on this opportunity.

- Over the course of a decade, the project evolved to take on a Balanced Scorecard approach to lab chemical waste management
- This resulting regulation was codified as RCRA Subpart K in 2008, after our data demonstrated increased pollution prevention

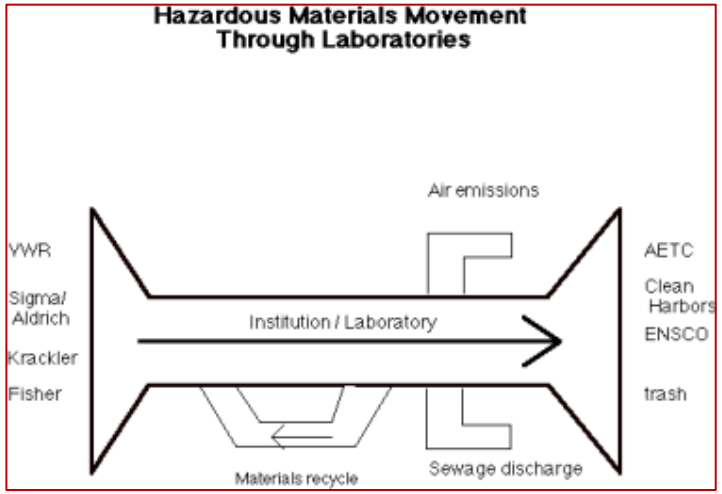
Lab-XL Logo



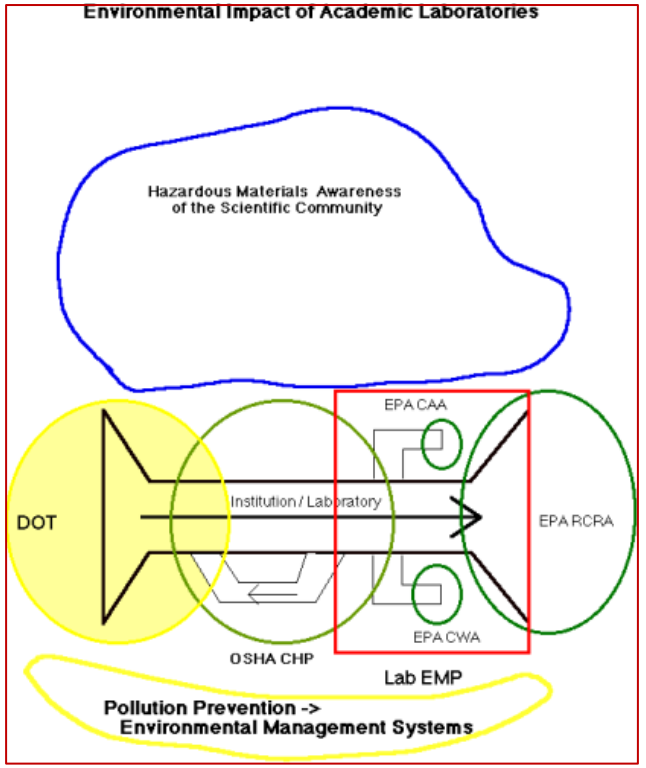
The PDCA cycle organizes a program to support "continuous improvement"

A Balanced Scorecard identifies a collection of indicators to track a program's progress

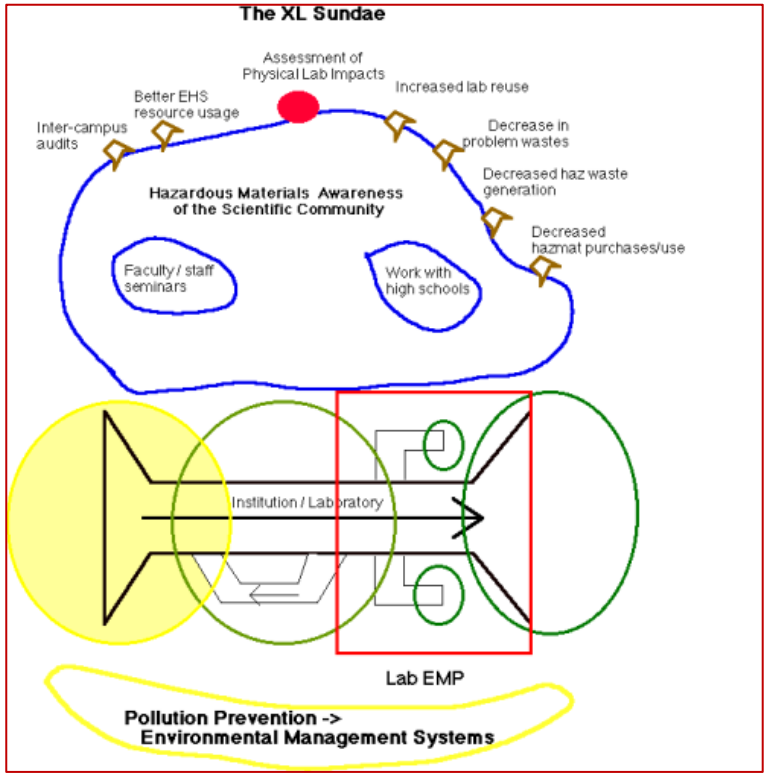
The Lab-XL Data Model We Used to Identify Indicators of Success



The Physical Model of Lab Chemical Use



Adding Stakeholders and Regulators to the Material Flow



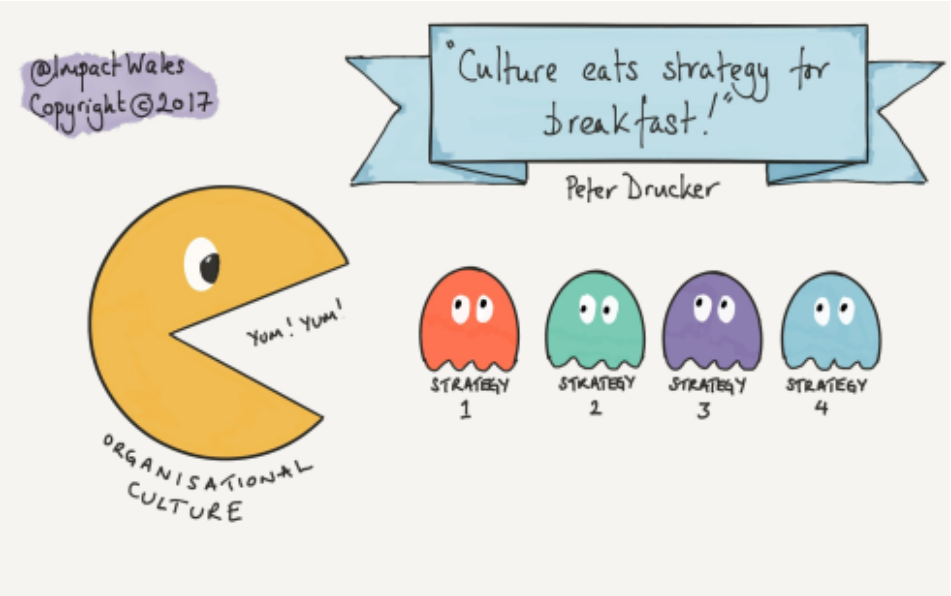
Identifying Potential Indicators of Success

Applying PDCA to Lab Wastes

Lab Waste Management phase	Tool
Plan	Roster of lab rooms, people and science
Do	Budget for waste management facilities, disposal costs and staff
Check	• Conformance audits by internal staff • Compliance inspections by regulators
Re-Act	Reorganizing reporting lines and budgets based on audit results (this process keeps the centralization / decentralization pendulum swinging)

These elements operate and change *simultaneously* and *independently*, so the system evolves unpredictably. "Culture" is how groups respond to unexpected changes.

Sustaining the XL Program: The Pivot to Culture



- Communicating with multiple stakeholders about the details of lab chemical waste management taught us to think metaphorically; this helped the 3 schools re-organize our data to tell an engaging story for both EPA and the campus community.
- In the process, we were able to leverage the cultural power of research in higher education by publishing 3 peer reviewed papers about the Lab-XL project; these publications established significant credibility within our institutions
- We gained less credibility in the wider academic sector, where administrative waste managers were more comfortable with RCRA and less comfortable with discovery research
- The Bottom Line:
  Culture is Life Outside the Management System

Risk Culture Theory

Chapter 5
Practices in the Danger Culture of Late Industrial Society

Arie Rip

Abstract The chapter replaces the question of risk control by one about how we handle danger in our societies and realize a measure of safety. Ongoing practices in a framework of 'danger cultures' are the key. The case of environmental and health inspection and the intersecting 'social worlds' involved, are used as a case to indicate important features.

Rip's Social Risk Model

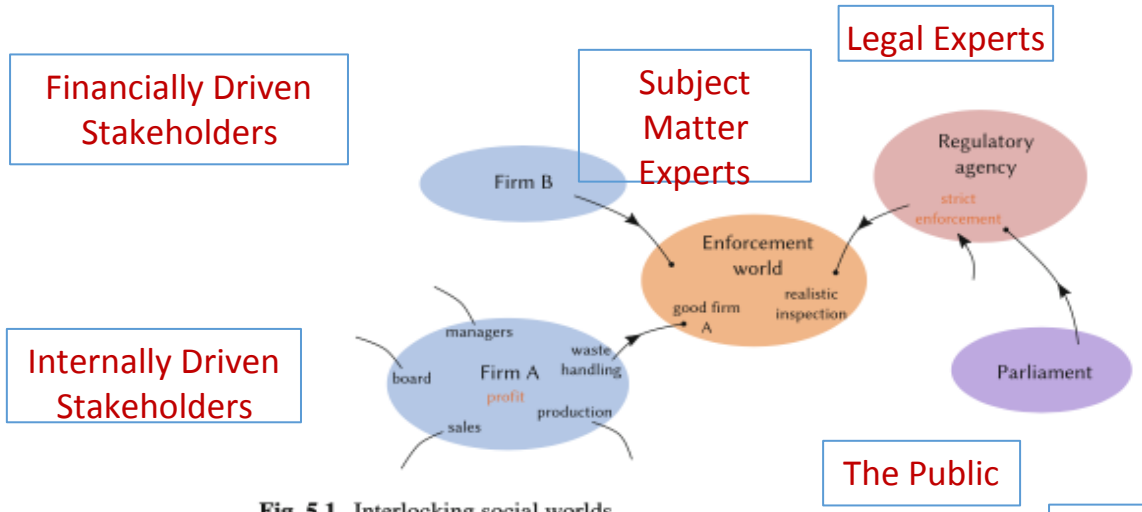
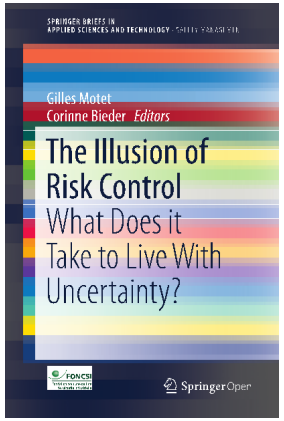


Fig. 5.1 Interlocking social worlds



The Illusion of Risk Control: What Does it Take to Live With Uncertainty?

The Risk Oversight Process

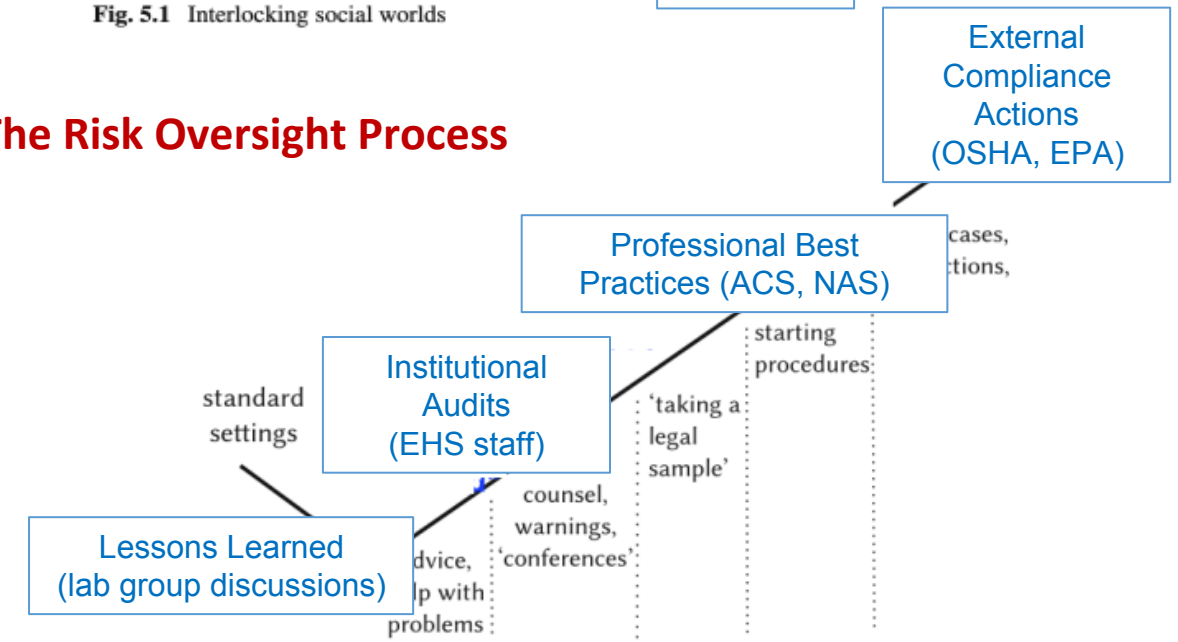
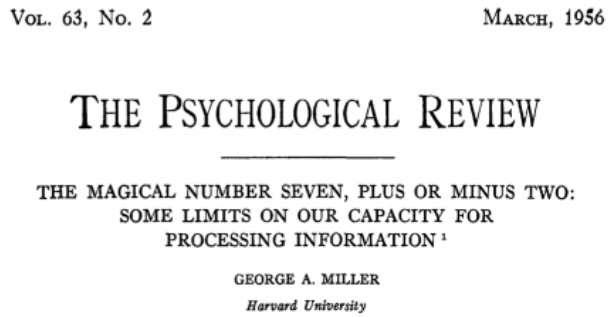


Fig. 5.2 Graded persuasion in the enforcement process

Reflections on *Safety Culture*

- The emotional labor associated with risky group work is embedded in safety culture practices
- Employees develop a vision for how their role connects to the organizational safety mission.
  - In the process, they use metaphors to consolidate complicated (risk) information into memorable chunks.
  - Cultures share stories to connect metaphors to explain *"what practices are safe enough"*
- Different risk cultures rely on different levels of Bloom's Taxonomy to manage safety/
  - This impacts where the emotional labor around risk is done
  - For example, RCRA culture is about remembering; research culture is about creating



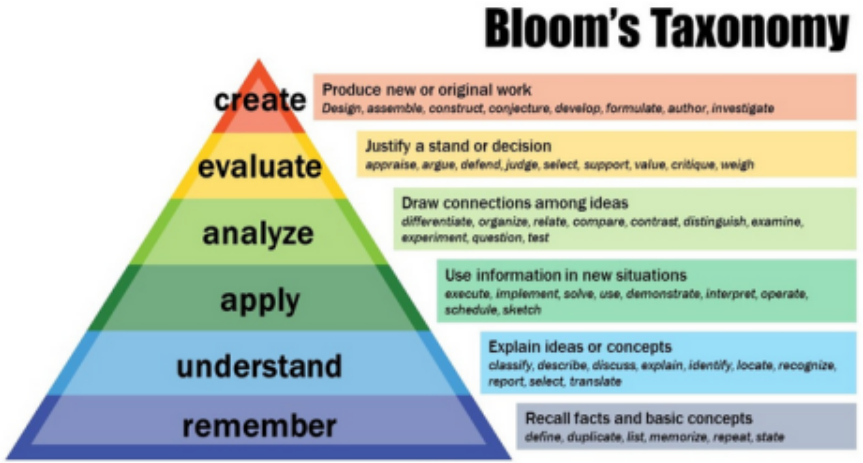
VOL. 63, NO. 2 MARCH, 1956

THE PSYCHOLOGICAL REVIEW

THE MAGICAL NUMBER SEVEN, PLUS OR MINUS TWO: SOME LIMITS ON OUR CAPACITY FOR PROCESSING INFORMATION [1]

GEORGE A. MILLER

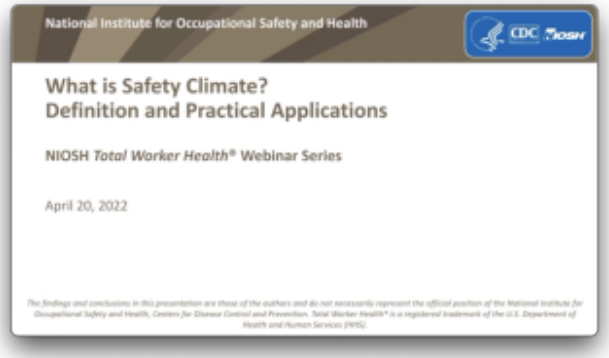
Harvard University



Reasons for Safety Culture Indicators

- Develop culturally aware expectations for training and oversight programs (Plan)
- Identify safety leadership skills appropriate to the roles and responsibilities of laboratory stakeholders (Do)
- Track progress in safety culture work (Check)
- Generate ideas for improving lab safety program practices (Re-act)
- ~~**NOT** to assess "safety performance"~~
- ~~**NOT** to compare locations or disciplines~~
- ~~**NOT** to generate Pass / Fail consequences~~

The Management System Model of Safety Culture (Model 1)


National Institute for Occupational Safety and Health

What is Safety Climate?
Definition and Practical Applications

NIOSH *Total Worker Health*® Webinar Series

April 20, 2022

Two Concerns with this model

- It assumes a single Organizational Safety Culture; that is not my experience of academia (or Rip's risk culture model, or Dr. Silbey's findings described yesterday).
- It is very difficult to generate SMART goals for a Balanced Scorecard working with 24 observations.

Ansbro Safety Culture Spectrum Where are you now? Where would you like to go? We'll help you get there.

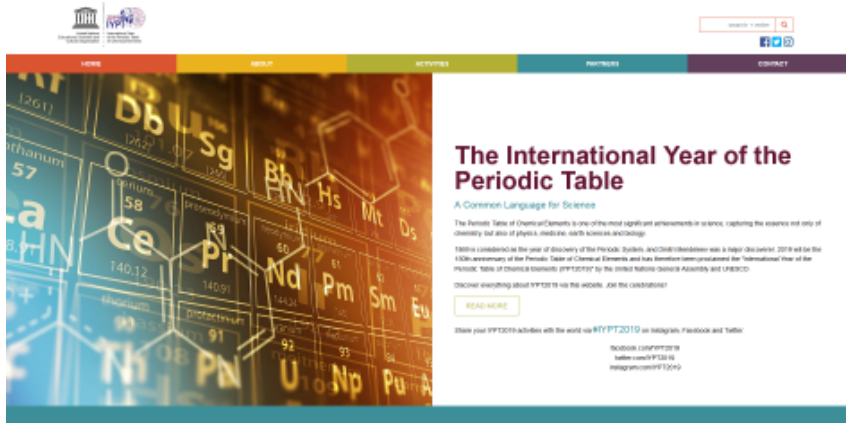
	Reactive Informal program	Compliant Focus on OSHA rules	Managed Leadership driven	Comprehensive Ownership at every level
Leadership	**Desires** to stay out of trouble **Lacks** a formal approach to safety **Thinks** *common sense* is a safety principle	**Follows** OSHA rules as foundation for safety program **Defines** success as avoiding OSHA fines and keeping insurance costs down **Uses** number of injuries as the basis for incentives **Expects** safety modeling only from those responsible for safety	**Promotes** injury prevention and health improvement through changes to management systems **Uses** safety as a measurement in performance reviews **Observes** behavior and tracks results **Identifies** trends using historical information **Expects** safe and healthy behaviors, starting with management	**Upholds** mutual respect, trust, and open communication **Values** safety as a deeply ingrained habit **Leads** a self-sufficient and sustainable organization **Measures** activities that lead to positive results **Challenges** employees to improve safety **Shares** responsibility **Considers** employee impact when making operational decisions **Sustains** safe behavior at all levels
Accountability	**Holds** employees accountable for not using *common sense* [instead of best practices] **Disciplines** employees most often after an incident or accident	**Sees** OSHA and workers' compensation as negative **Disciplines** by policing and as a way to ensure compliance **Designs** incentives in a way that might discourage injury reporting	**Gives** supervisors clear responsibility for safety **Holds** employees accountable to defined responsibilities and procedures **Incorporates** safety expectations into annual performance reviews **Bases** incentives on improving results such as incident rate or lack of claims	**Rewards and recognizes** positive behaviors, not results **Balances** discipline with coaching for learning and improvement **Promotes** peer-to-peer coaching and observation in individuals and teams
Employee involvement	**Sets** no expectations for employee behavior	**Expects** employees to follow OSHA regulations	**Believes** safety and health improvement are important to the company and should be valued by all employees **Responds** to employee concerns **Seeks** employee input and involvement	**Engages** in open communication; demonstrates mutual trust and respect at all levels **Takes** an active role in workplace improvement **Empowers** employees at all levels to communicate concerns **Measures** employee perceptions **Leverages** employee strengths
Risk assessment	**Believes** that outcomes are often beyond control; systems fail **Assesses** hazards only after an incident **Disregards** industrial hygiene exposures	**Investigates** accidents superficially **Assesses** risk [job hazard analysis, for example] to a small degree **Applies** OSHA limits to industrial hygiene exposures	**Investigates** the root cause of incidents and accidents **Assesses** hazards and controls during preplanning and on a regular basis **Uses** health-based limits to protect employees from industrial hygiene exposures **Evaluates** ergonomics on a systematic level	**Improves** systems continually **Identifies** emerging or unrecognized hazards and takes action
Programs, procedures, policies, and training	**Relies** on worker experience without verification of skills and knowledge **Emphasizes** informal on-the-job training **Focuses** on production at the expense of safety	**Considers** implementation of OSHA-mandated programs adequate **Trains** as required by OSHA, often through videos **Uses** OSHA-required template as generic written program **Assigns** one person or a committee to be responsible for safety	**Integrates** safety and improved well-being into entire culture **Implements** and maintains programs that effectively address systems improvement **Develops** training based on job hazards **Emphasizes** new employee training and ongoing coaching **Applies** written policies at all levels	**Fosters** risk-taking and innovation in problem-solving **Creates** opportunities for learning at all levels **Shares** responsibility and collaborates at all levels **Transforms** itself as improved practices are discovered
Equipment, budget, and environment	**Demonstrates** indifference to safety; may have a poster **Considers** hazards, injuries, and unsafe processes as the cost of doing business **Uses** outdated equipment **Neglects** safety and health in budget	**Uses** personal protective equipment as the key safety measure **Provides** safeguards based on OSHA-compliance **Responds** after the fact rather than thinking proactively **Funds** industrial hygiene and safety fixes for compliance only	**Uses** engineering controls and equipment to manage hazards **Builds** safety procedures into every process **Includes** safety items in every budget	**Considers** employee safety and health in budget and purchasing decisions **Plans** safety and well-being into every process, including ergonomics **Continually** updates equipment, environment, and materials to the most current technology

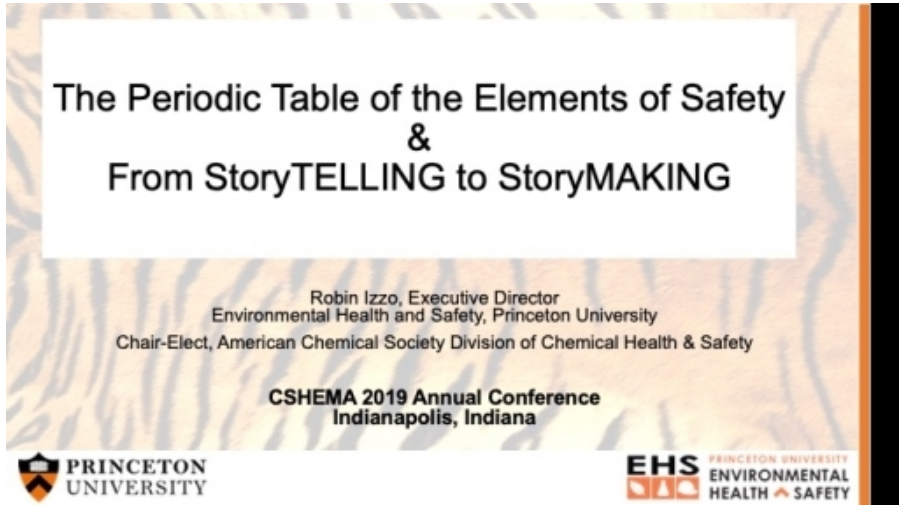
Dedicated to the memory of Trevor Ansbro, SAIF senior safety management consultant, who developed this model

With This in Mind, An Alternative Cultural Model: Story-Making (Model 2: Research)

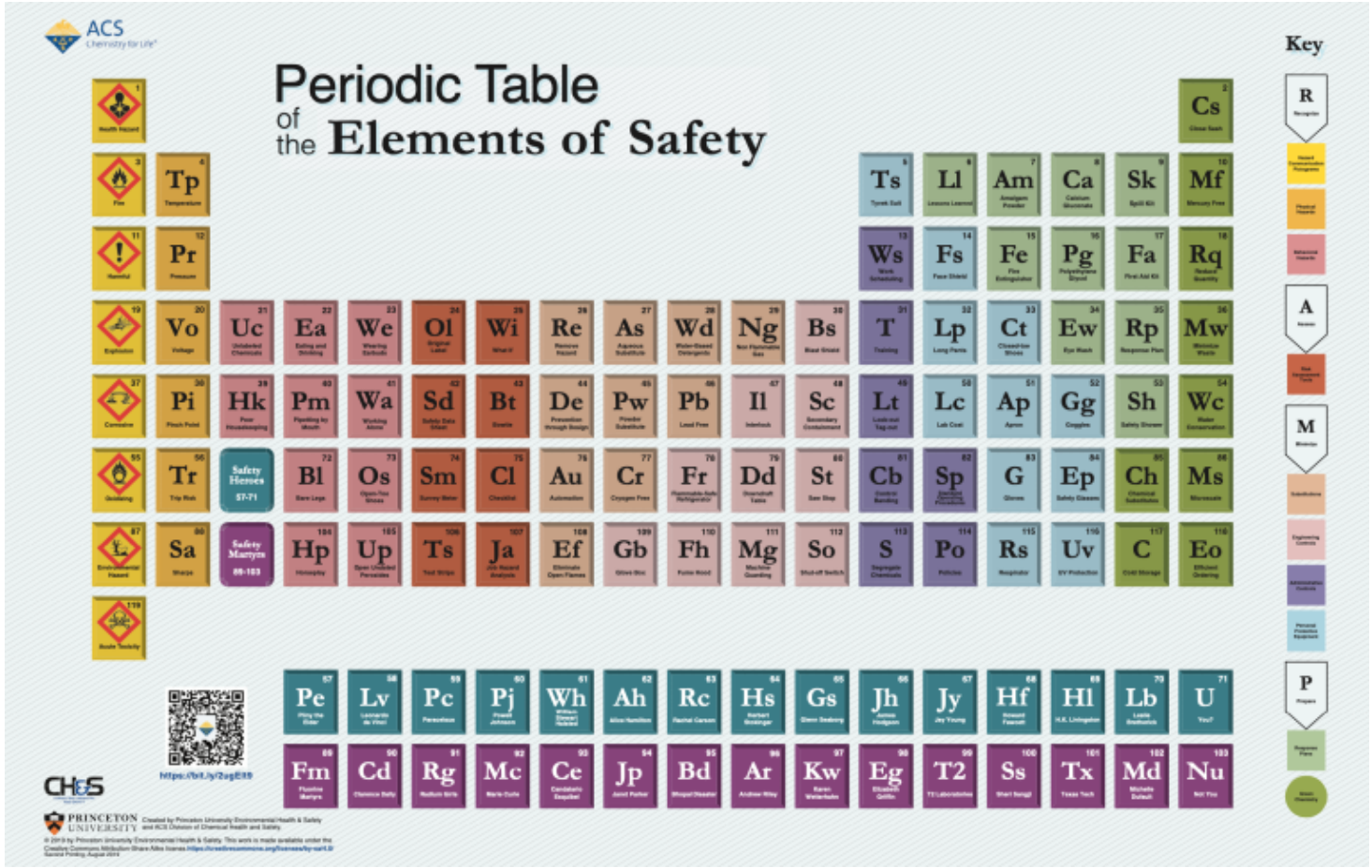
Story Telling can inspire an engaged audience to generate new ideas

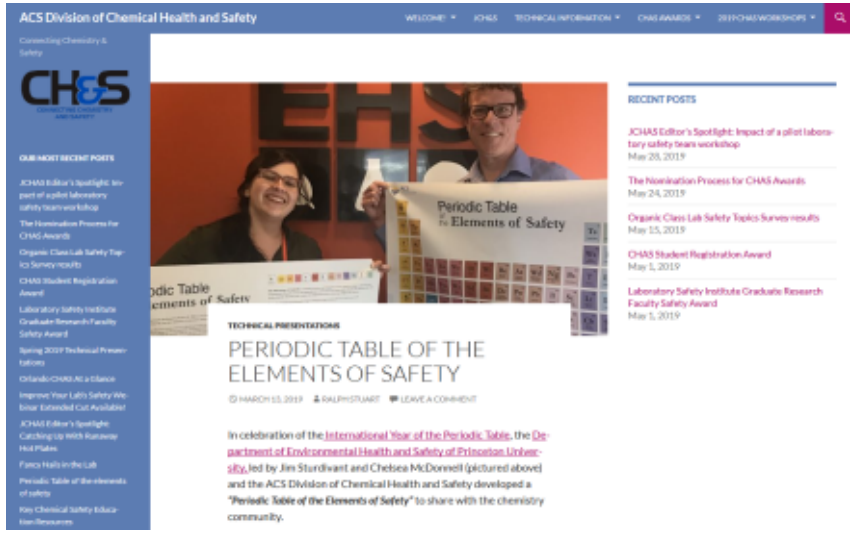
However, the Story Telling model is a problem if the story changes as it is re-interpreted and shared by people with different priorities.





Elements of Lab Safety to Build Culturally Relevant Stories With



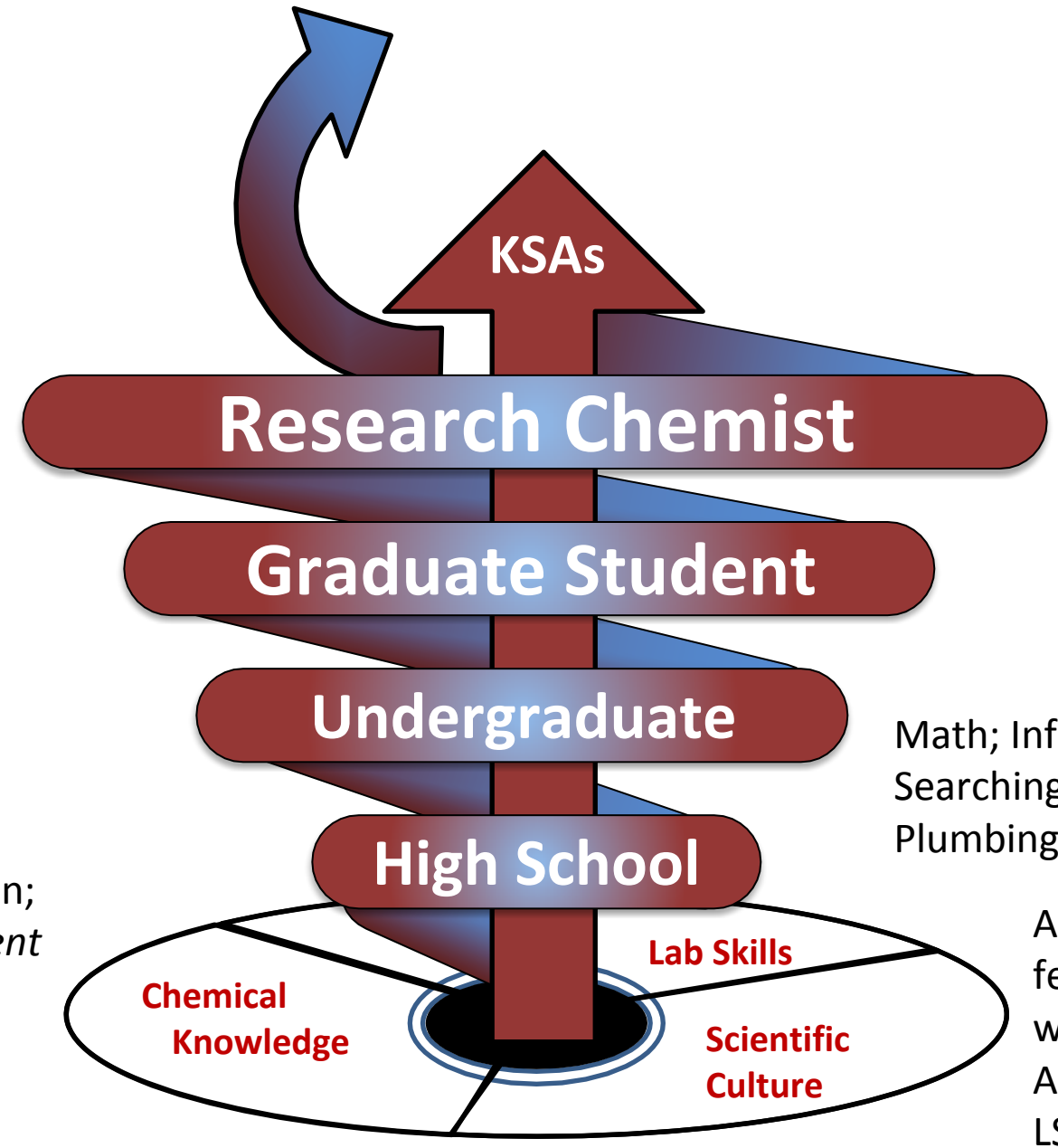


An indicator of the relevance to lab culture of this tool is that it is the most visited page on dchas.org

Model 3 Teaching: The Academic Education Model

Management cycle aspect	Lab management practices
Plan	Semester-level flexibility is the top priority because academic lab sciences, technologies and people are significantly impacted by changes in that timeframe
Do	Routinely underfunded project work is pursued, based on student labor rates
Check	Will this work pass peer review for either funding or publishing?
Re-Act	Using scientific learning to write the next project plan

An Educational Model for Safety KSA Development



Chemical Sciences and Safety Education; SACL and *Prudent Practices*

Math; Information Searching; Plumbing

EDUCATION

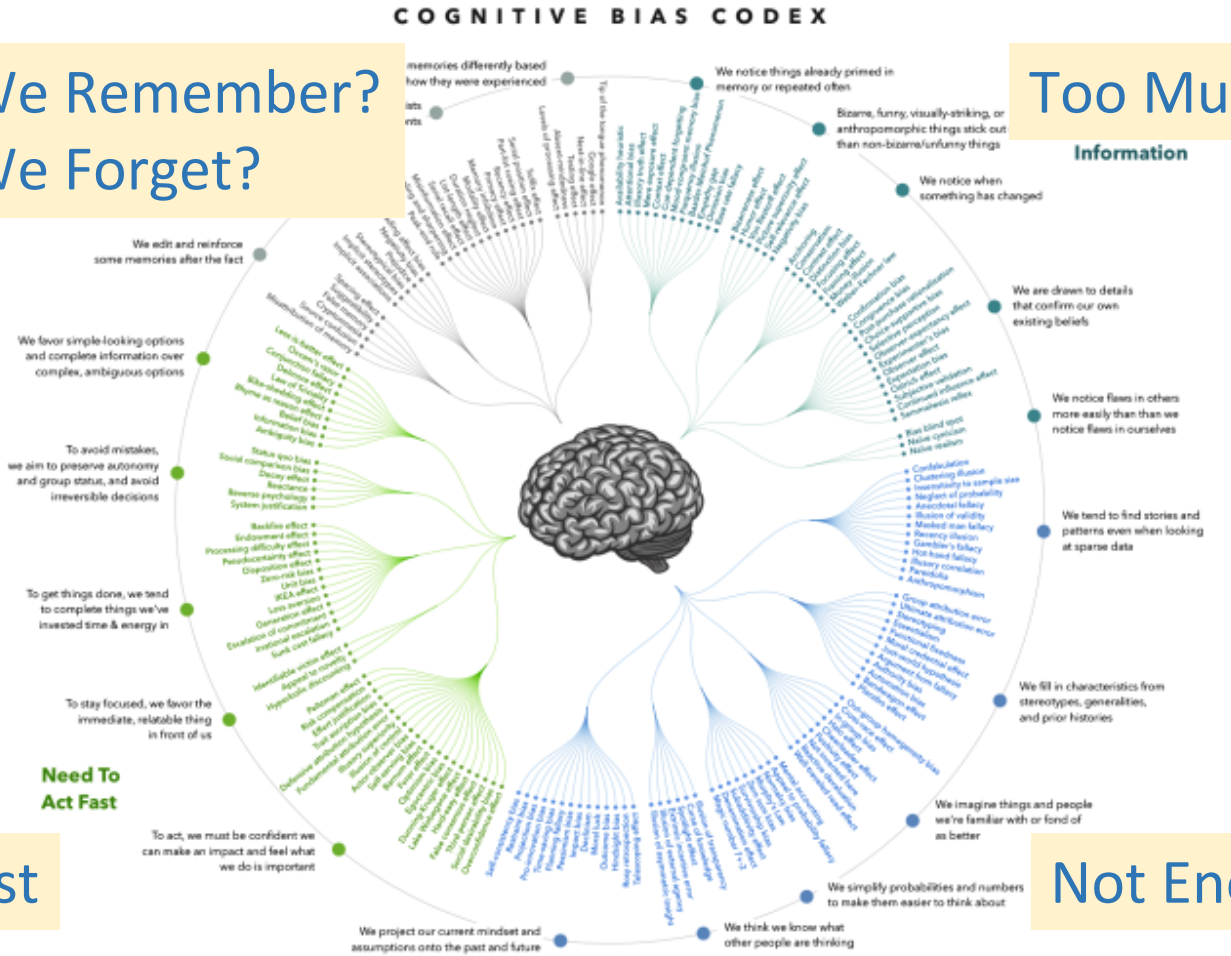
Awareness of broader community's fear of hazardous chemicals; familiarity with expectations of Safe Science, APLU resources and opportunities in LST work

Model 4 Service: Identify and Work with Cultural Biases about Hazardous Waste

Risk Culture Diversity in organizations arises when varying priorities lead to "Cultural Cognitive Biases"

What Should We Remember?
What Should We Forget?

Too Much Information



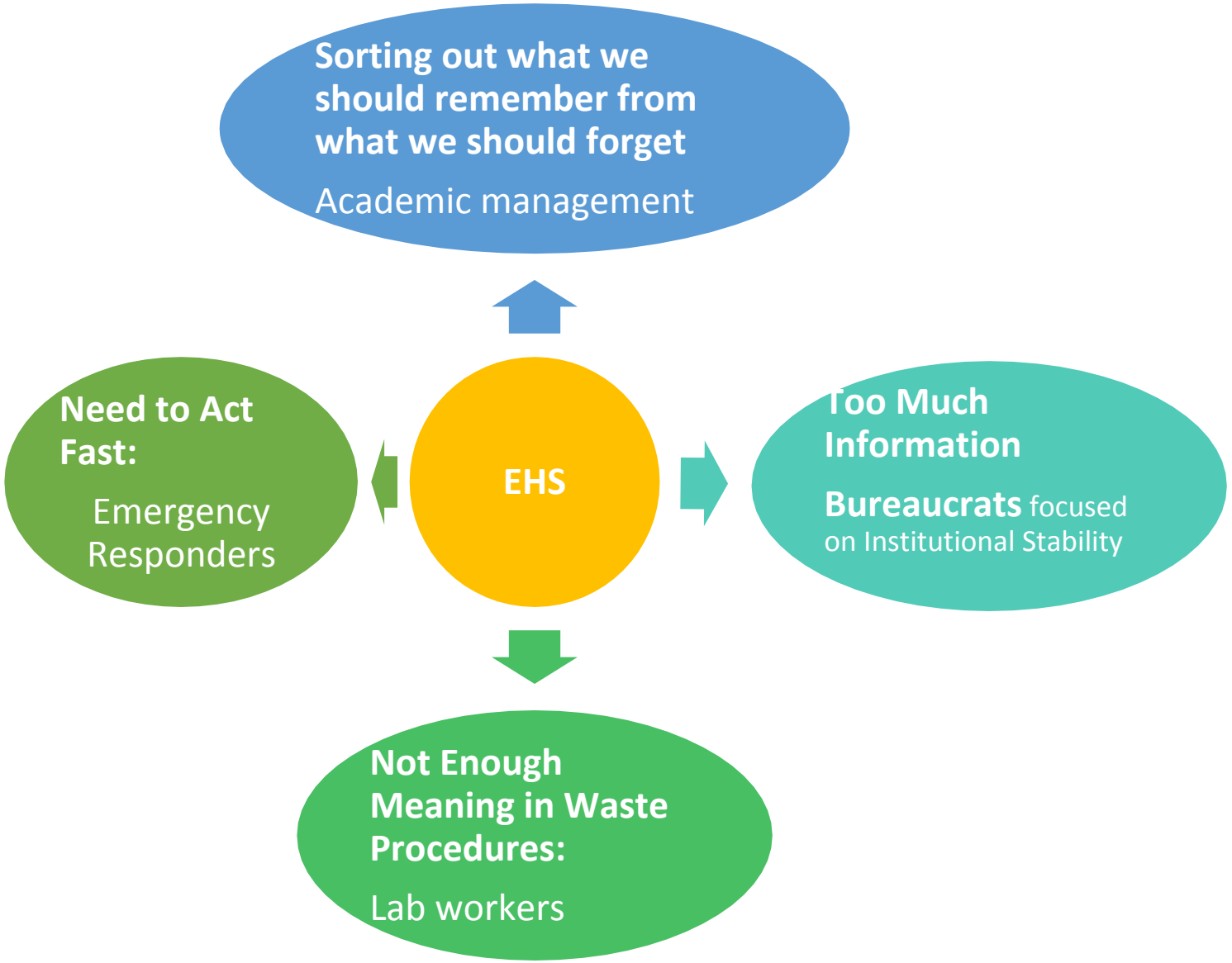
Examples of cognitive biases:
Confirmation Bias
Selective perception
Cue-dependent forgetting

Need to Act Fast

Not Enough Meaning

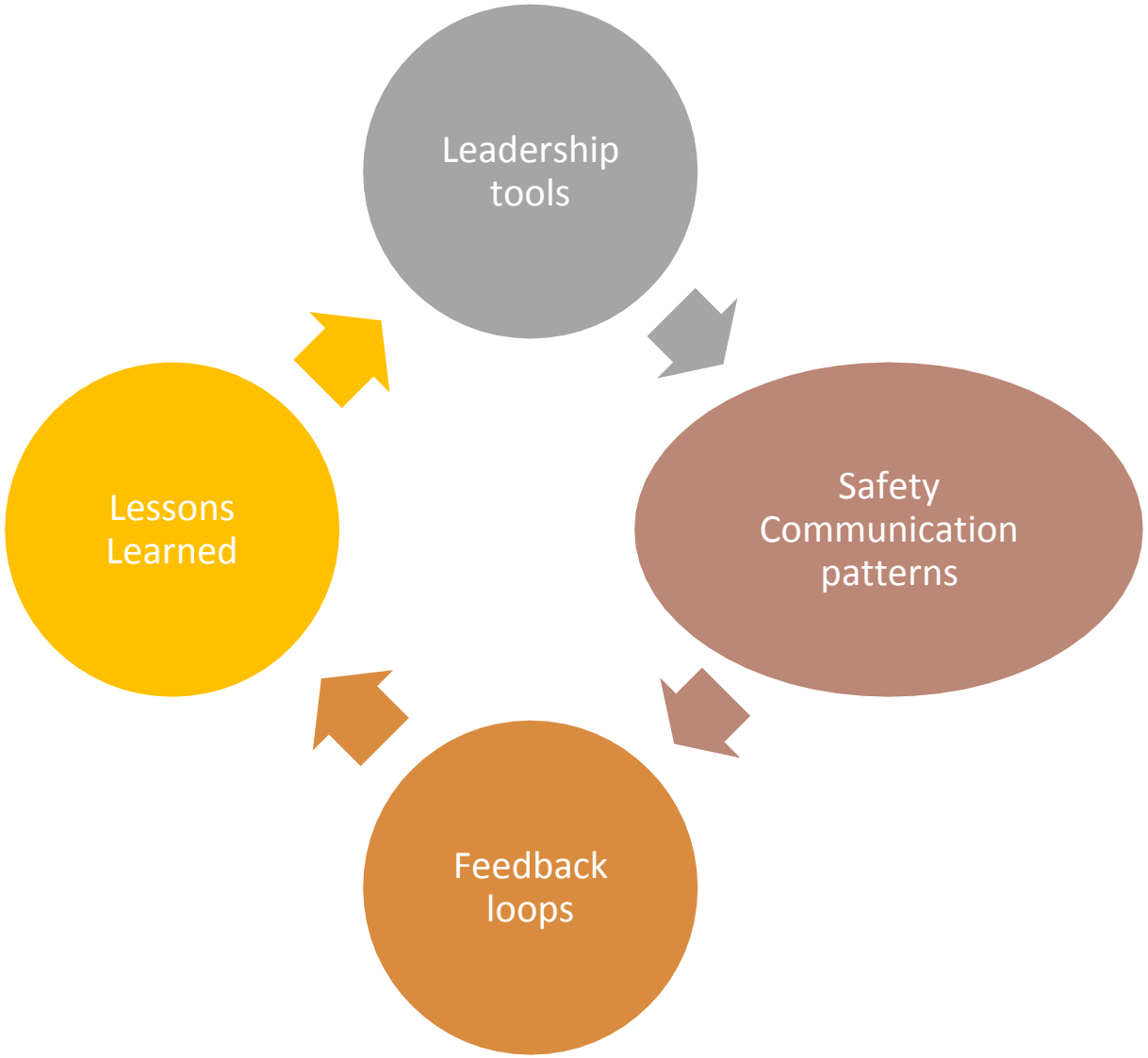
https://www.teachthought.com/critical-thinking/cognitive-biases/

Cultural Practices Relative to Lab Waste in Academic Organizations



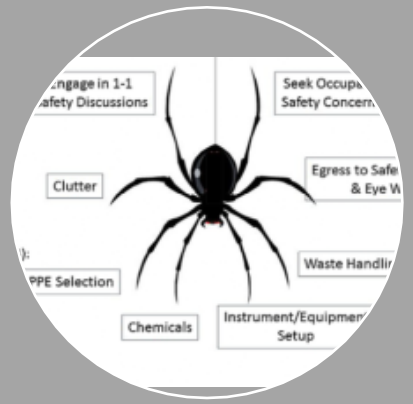
- The Lab-XL Project redistributed information roles and responsibilities from the RCRA model to an institution-based model
- This meant labs could focus on scientific opportunities for waste minimization rather than RCRA waste codes.
- We also expanded the stakeholder pool to include emergency responders

Potential Safety Culture Indicators



Aspect	Indicator
Leadership (aka MBWA: Management by Walking Around)	Number of leadership lab visits that discuss safety (see https://dchas.org/2021/05/13/bms-spyder/)
Communication Patterns	Safety messages that connect to the mission
Feedback Loops	Education about listening practices when safety concerns are raised
Sharing Safety Lessons Learned	Publishing Lessons Learned (as described in *ACS Guide for Scholarly Communication)*

All Culture Indicators are Local



Leadership tools

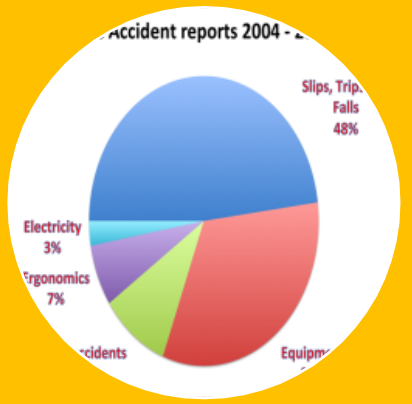
- Bristol Myers Squibb's Spyder program

Safety Communication patterns

- KSC metals shop signage that supports *"enclothed cognition"*

Feedback loops

- KSC Wood shop signage encouraging dialogue about safety and other topics



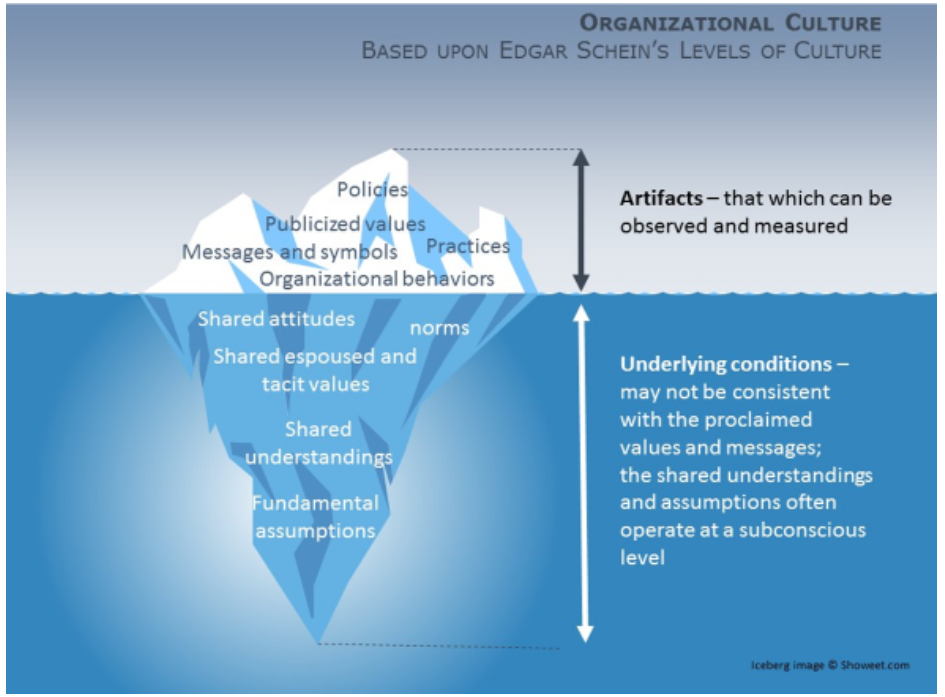
Sharing Lessons Leaned

- Real life Data about Incidents at KSC as part of onboarding

Three Take Home Messages

This is a big topic, but key points that comes out of this portion of it is:

1. Culture change programs are most effective when they fit within the larger mission of the organization. In academia, the larger mission is ***"teaching, research, service".***
2. Academic laboratory cultures are **internally diverse** with a wide variety of risk cultures co-existing in the same location and organizations
3. Indicators of changes in risk culture will **evolve over time** as the culture responds to environmental changes



A *Safety Culture Iceberg* from Mary Beth Mulcahy's CHAS Journal Club Presentation

Questions?

It takes a village to build a culture!

My thanks to:

- Dan Kuespert for his question the kicking off this symposium
- Arie Rip and Susan Sibley for their research
- The Lab-XL Schools for the data
- Robin Izzo and her staff for graphical thinking
- Sammye Sigmann for help in identifying how connect to academia's educational mission
- Mary Beth Mulcahy for pursuing safety culture technology transfer from the CSB to the lab setting