Structured Development of SOPs:
A laboratory hazard assessment tool

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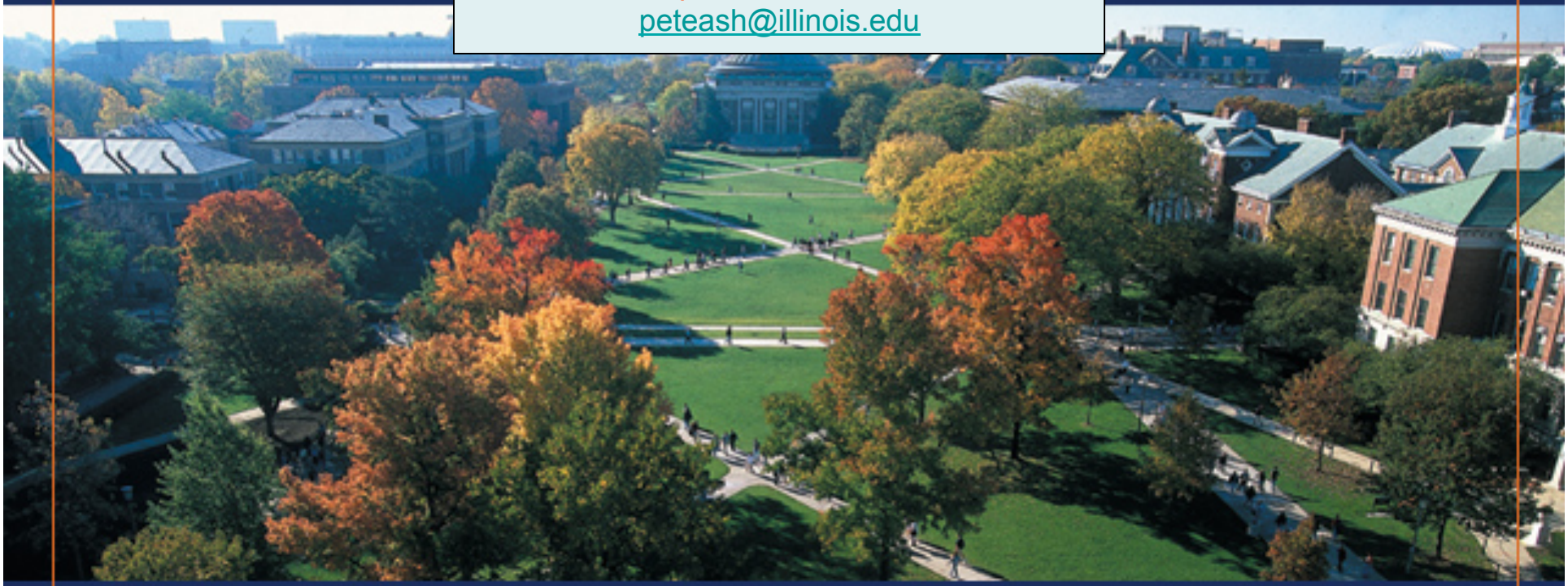


UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Structured Development of SOPs

Objectives for this presentation

- Overview a method of laboratory hazard assessment
- Show how this method can easily lead to SOP preparation

University of Illinois at Urbana-Champaign

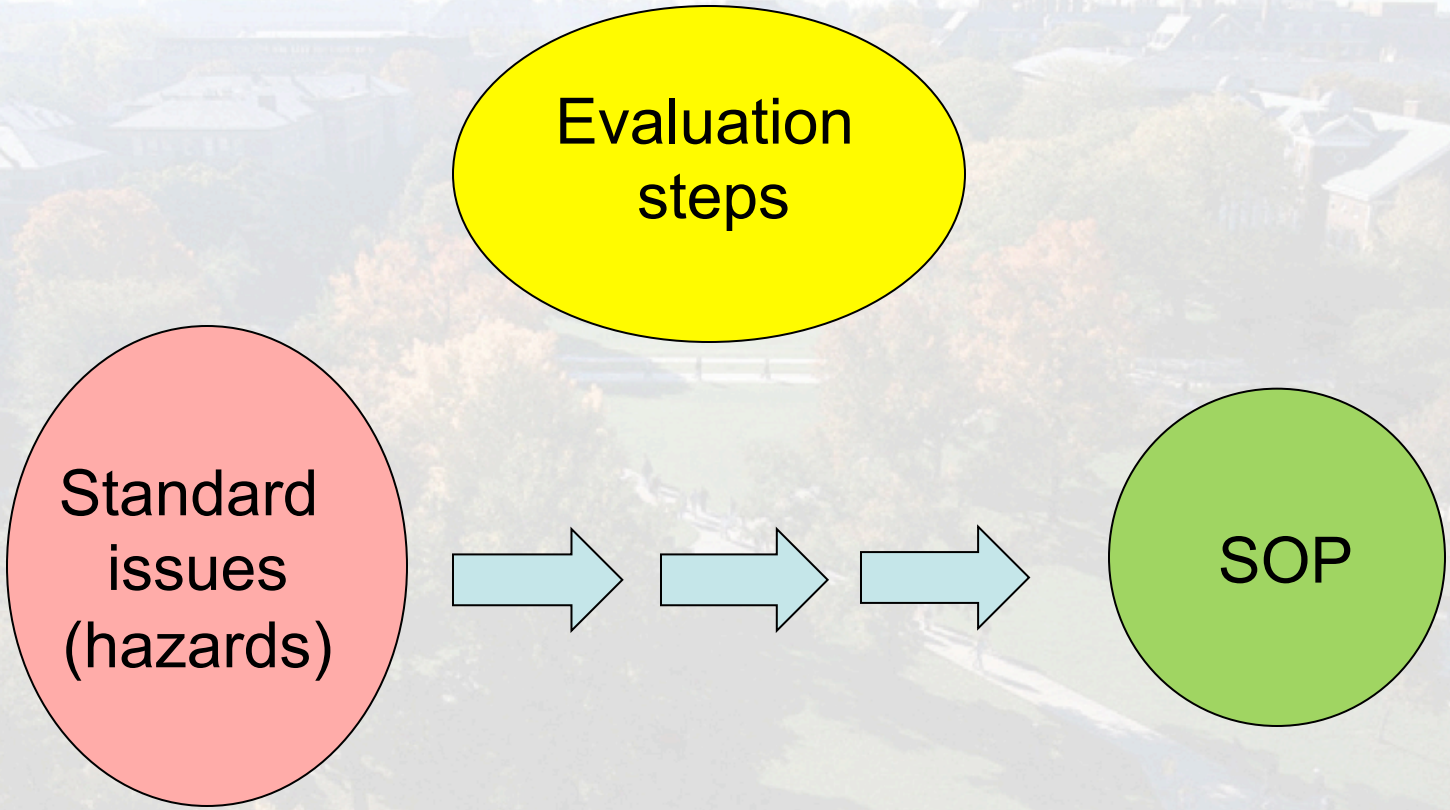
A few facts about the University:

- 44,520 students
- About 1600 laboratories
- Operating budget of $1.96 billion
- $564 million in research
- More international students than any other U.S. public university

Big Picture Issues

- We want to better equip laboratory workers to do hazard assessments.
- Laboratory workers are very busy and want to do hazard assessments quickly.
- How do we get them to understand that hazard assessment can be a lengthy, continuous process?
- This ACS Task Force has provided a number of tools to help with hazard assessments, but all work better when more effort is expended.

Structured Development of SOPs Process



Structured Development of SOPs

Took a look at standard issues such as:

- Regulatory concerns
- Human factors
- Facility
- Materials
- Equipment and Labware
- Process
- Effect of change in design conditions
- Additive, synergistic, or unknown effects
- Effluents and waste management
- Availability of PPE
- Emergency response resources
- Potential failure points or activities with high risk of harm

Structured Development of SOPs

Evaluate each step or task in a structured manner:

- Hazard identification
- Specific issues identified
- Risk assessment
- Review existing knowledge
- Strategies to address hazards
- Develop a Plan A
- Review what could go wrong
- Develop a Plan B
- Will standard precautions be adequate?

Evaluate Each Step or Task	Hazard Identification - Known and Potential Hazards - Safety constraints & restrictions	Specific issues identified	Risk Assessment - What is most likely to go wrong - what are most severe consequences even if unlikely?	Literature search and consultation with experienced supervisors for lessons learned
Regulatory Concerns	Understanding applicability, cost constraints, lack of options, delays, require assistance, permits			
Human Factors	Inexperienced worker, new experiment, work hours, follows directions, medical conditions, effect of errors, effect of cold or fatigue, language barrier			

Evaluate Each Step or Task	Hazard Identification - Known and Potential Hazards - Safety constraints & restrictions	Specific issues identified	Risk Assessment - What is most likely to go wrong - what are most severe consequences even if unlikely?	Literature search and consultation with experienced supervisors for lessons learned	Strategies to Eliminate, Control or Mitigate Hazard
Regulatory Concerns	Understanding applicability, cost constraints, lack of options, delays, require assistance, permits	Fire codes for flammable compressed gases limits storage amounts and conditions, regulators, tubing, connections and may require special storage, alarms, etc. Fire code requires conditions for safe egress. Compressed gases are regulated by NFPA and OSHA. NFPA also regulates toxic gases - see below.	Improper storage can lead to a leak or high vol. gas release. Improper connections can lead to a leak or static buildup. Emergency response may be impeded by lack of shut off valves or kill switches. Lack of fire alarms/suppression could result in catastrophic fire damage. For flammable gas CO, regulatory concerns relate to flammability, toxicity, and gas under pressure - see below	NFPA codes have been written to address deficiencies in construction, operations, storage, etc. that had led to loss of life. Literature reviews should uncover laboratory accidents involving most flammable gases, compressed gases, many pieces of equipment and many processes. Additionally, the release of toxic gases is well documented	CHP, OSHA carcinogen regulations, controlled substances DEA regulations, permits for select agents and/or radioactive materials, etc. Review compliance plan with EH&S or other local and national experts. Consult technical experts from gas vendor for guidance. Make a checklist using applicable regulations and insert into lab safety manual or CHP

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Human Factors	Inexperienced worker, new experiment, work hours, follows directions, medical conditions, effect of errors, effect of cold or fatigue, language barrier	Relatively new graduate student from overseas with limited command of English. New experiment for this student.	Student may misunderstand parts of scientific procedure/safety procedures. Student may not have been adequately prepared or trained. Student may not be able to acquire emergency help.	Student should be required to review literature extensively to understand the hazards, potential for accidents, measures for mitigation or prevention of an accident.	reiterative training, enforce lab rules, supervision, ascertaining worker knowledge, ensure worker is well-informed, practice small, SOP's, buddy system. Ensure student has taken all relevant training including emergency response. Student should be directly supervised until he/she has shown proficiency in all aspects of hazard control and emergency response. Student should write SOP and review with senior lab staff.
Facility	lighting, handwash sink, egress, electrical circuits, ventilation, emergency equip., code adherence, confined space, storage arrangements, sturdy shelves		Is gas segregated from oxidizers? Is cylinder secured? Does the cylinder impede egress? Are there sprinklers in the laboratory and/or the hood?		ensure proper environment and conditions - **can use checklist**

Standard Operating Procedures

Sample format:

- Summary of how material will be used
- Identified hazards
- Regulatory issues
- Engineering controls
- Work practice controls
- Specific experimental procedures
- PPE
- Storage
- Waste disposal
- Spills and releases
- Emergency procedures
- Training records
- Documentation

Strengths of this method

- Comprehensive
- Flexible, can incorporate alternate assessment methods
- Can be modified by laboratory to meet specific needs
- Takes the analysis and places it into an SOP
- Can be easily reviewed by others
- Can be easily updated

Drawbacks to the method

- Time consuming
- Not simple—may be better to try an alternate method first
- May be avoided because of comprehensiveness
- Focusing on filling in all the boxes may cause some to miss important issues
- Can be intimidating if users feel a need to fill in every box on the table

Suggested Approach

- Gain hazard assessment experience by using an alternate method
- Use this method to ensure a comprehensive review of hazards
- Do a quick run through to identify most pressing issues, then put detailed effort into assessing these

Summary

Structured Development of SOPs:

- Provides a comprehensive mechanism for assessing laboratory hazards
- The mechanism makes it easy to translate the assessment into an SOP

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Questions?