Incorporating Hazard Assessment into Laboratory Curricula:

One Pathway to Growing a Sustainable Safety Culture

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Presentation Outline

- What and Why of Safety Culture
- ACS Committee on Professional Training
- Institutional Curricular Constraints
- Integrated Approach
- Assessment

What is Safety Culture?

U.S. Dept. of Labor describes Safety Culture where within the work environment

- Everyone feels responsible for each other
- All the time
- Takes the extra step to identify unsafe conditions or practices [for themselves and others] and takes corrective actions.

Why Build a Safety Culture?

- "Right Thing To Do"
- Safer work environment
- Fewer accidents / injuries
- Encourages Team Building
  - Look out for others
  - Promotes "Buy-In" at all levels
- Industrial Setting: leads to increased productivity and improved worker satisfaction

Importance in Academia?

- Safer academic and research labs
- Better prepare all degree graduates to enter profession
- Compliance with Chemical Hygiene Programs

Reality!!!

- Anecdotes from Industry: New graduates don't easily fit into existing safety cultures.
- Division of Chemical Heath And Safety [DCHAS-L] "Chemical Safety Headlines from Google"
  - Reports incidents, accidents, injuries and fatalities
    - Industrial
    - Transportation
    - Academic – Undergraduate and Graduate Labs
    - Middle & High School Labs – Museums etc.

Reality!!!

- U.S. Chemical Safety Board – Reports and Investigates Chemical Related Incidents
- Council for Chemical Research – suggests Need for Change in Behavioral Competencies
- ACS Presidential Commission "Advancing Graduate Education in the Chemical Sciences"
  - Concludes in part "Academic chemical laboratories must adopt best safety practices."

Reality!!!

- We have not always done a good job in the past.
- Summary:
  - Do a better job to implement best practices in all academic and research labs.
  - Implement change to develop a safety culture climate

Reality!!!

- ACS Committee on Professional Training 2015 Guidelines, requires Approved Undergraduate Degree Programs
  - "...promote a safety-conscience culture…"
  - "…must begin during the first laboratory experience …"
  - include assessment of hazards and risks
  - Inherent in all levels of curriculum
  - Functional Safety Committee

Curricular Constraints at UNLV

- Approaches Considered
  - Develop a required course on laboratory safety
    - Safety Culture
    - Hazard Assessment Report
      - Hazard recognition
      - Assessment of hazards and risk
      - Manage or eliminate hazard

Curricular Constraints at UNLV

- Approaches Considered
  - Lab Safety Course Continued:
    - Where to place it in curriculum?
      - Prerequisite for first lab course
        - » Majors and/or Non-majors?
      - Junior or Senior level major's course
        - » Inconsistent with 2015 Guideline for first lab experience

Curricular Constraints at UNLV

- Approaches Considered
  - Lab Safety Course Continued:
    - Will the course fit into the degree curriculum?
    - NSHE Board of Regents mandated credit limit set at 120 credits for all degree programs
      - Impossible to add course without negative effects to degree programs
    - Conclusion: For UNLV, an Undergraduate Lab Safety Course will not work at this time.

Curricular Constraints at UNLV

- Approaches Considered
  - Supplement current pre-lab lectures with safety information and hazard assessment concepts
    - All Labs? Some Labs?
    - All Majors? Just Chemistry Majors?
  - UNLV Labs are not segregated by Major, thus All Labs, All Majors
  - What level of instruction is appropriate?
    - Lab time considerations require a progressive approach

Curricular Constraints at UNLV

- Decision: Supplement Pre-Lab lectures
  - Use approach starting with basics in General Chem Labs, progressively becoming more sophisticated
    - First Year – Basics, through Senior Level - Intensive
    - Identification and assessment of hazards with each successive lab course
    - Introduces Hazard Recognition to All Majors in All Labs and methods to reduce or manage hazards.

Curricular Constraints at UNLV

- General Education Reform at UNLV
  - Special Experiences for each year level.
    - First and Second Year more generic experiences; curricular content not under our control
    - Third Year Milestone Experience
      - Intensive Research Paper Discussion and Critique in Analytical Chemistry Course focusing on Technical Analysis and Written Communication Skills
    - Fourth Year Capstone or Culminating Experience
      - Written Hazard Analysis Report as part of student's senior lab grade. Also serves as Assessment Tool

Implementation

- Students introduced to Safety Data Sheets and information contained therein during pre-lab lectures
- Students introduced to concept of Hazard Recognition and basic Hazard/Risk Assessment
  - Considering
    - Specific Hazards
    - Quantities of Materials Used
    - Concentrations of solutions
      - Example: Concentrated vs Dilute Solutions of H_2SO_4
    - Safe Handling & Management Practices
    - Mitigation Methods and Exposure Response Procedures

Implementation

- Graduate TAs teach in all undergraduate labs
  - Gen Chem and Organic Chem, TAs supervised by lab coordinator
  - Junior and Senior Labs, TAs assist faculty.
- TAs receive intensive training before fall semester
  - Chemical Hygiene and Safety Culture Concepts
  - Hazard Awareness and Identification
  - Hazard and Risk Assessments
  - Departmental Expectations for Presenting Information to students in labs

Implementation

- Significant TA Challenges
  - Undergrad experiences are varied,
  - Cultural, Language and Communication issues
- Assign first year TAs to shadow second year TAs

Implementation

- Safety Related Questions on Lab Quizzes and Exams with written reports in advanced labs

- Related Positive Outcomes
  - Graduate TAs bring practices into research labs
  - Degree recipients better prepared to function as a professional chemists or graduate students.
  - Non-majors develop a heightened hazard awareness and basics of hazard assessment.

- COMMENTS - QUESTIONS?

- Thank you and the ACS DCHAS for this opportunity.