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 H₂SO₄
    • 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.