Review of Progress and Challenges in Promoting Enhanced Safety Instruction

Spring 2019
National ACS Meeting

April 1, 2019
Orlando FL

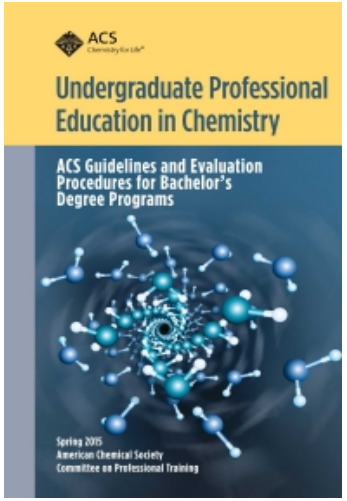
David C. Finster
Wittenberg University

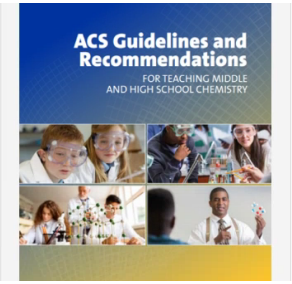
Review of Progress since 2008…

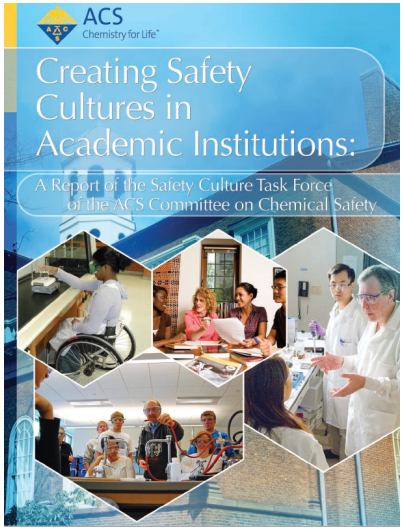
CPT Guideline use of verbs (with regard to safety instruction)

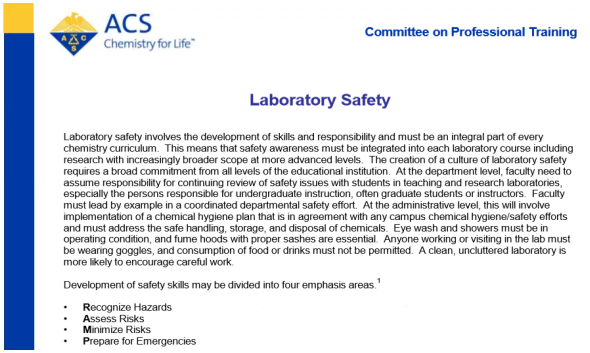
2008: “must” = 0
“should” = 4

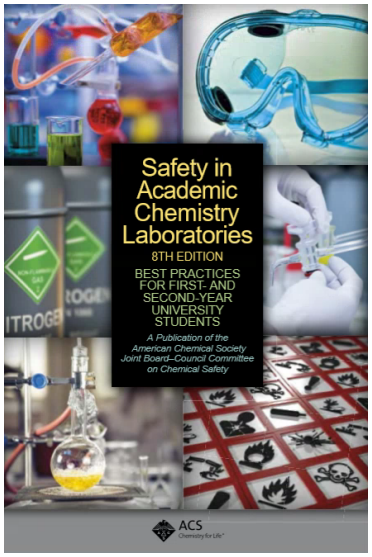
2015: “must” = 4
“needs to…” = 2
“should” = 1 (for six bulleted items)

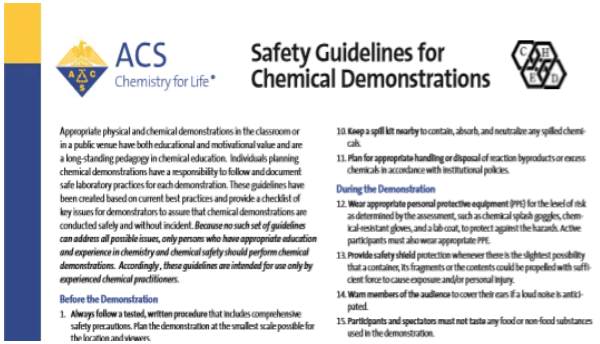


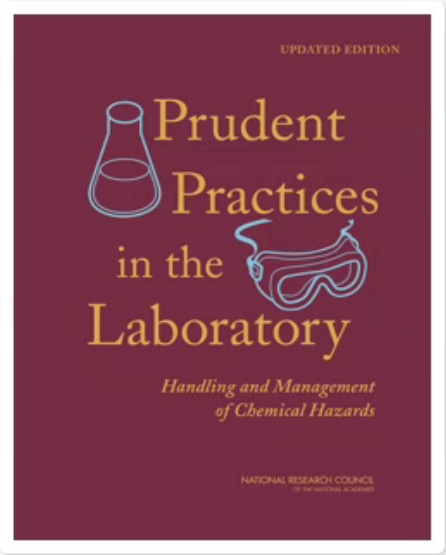











UPDATED EDITION
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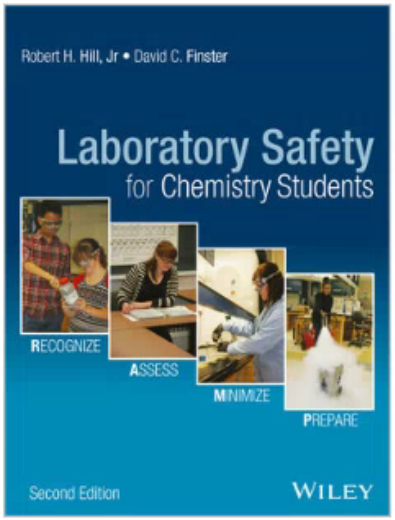
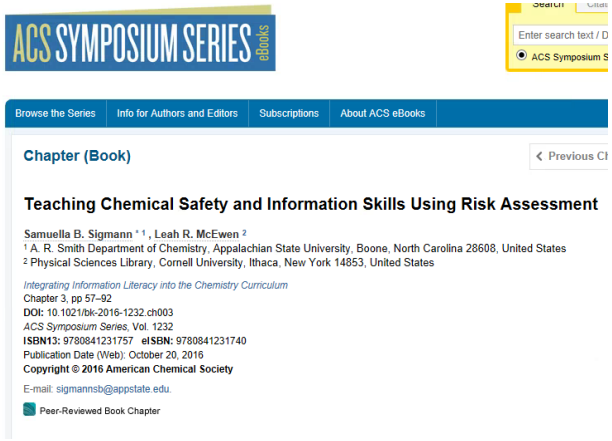
Handling and Management of Chemical Hazards
NATIONAL RESEARCH COUNCIL


Robert H. Hill, Jr • David C. Finster
Laboratory Safety for Chemistry Students
RECOGNIZE
ASSESS
MINIMIZE
PREPARE
Second Edition
WILEY


SAFE SCIENCE
Promoting a Culture of Safety in Academic Chemical Research
NATIONAL RESEARCH COUNCIL


A guide to implementing a
SAFETY CULTURE
in our universities
ASSOCIATION OF PUBLIC & LAND-GRANT UNIVERSITIES
APLU Council on Research
Task Force on Laboratory Safety



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Chapter (Book)

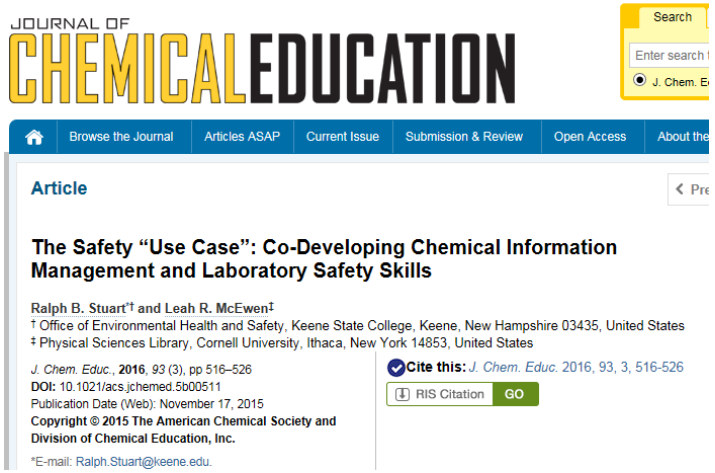
Teaching Chemical Safety and Information Skills Using Risk Assessment

Samuella B. Sigmann [*1], Leah R. McEwen [2]
[1] A. R. Smith Department of Chemistry, Appalachian State University, Boone, North Carolina 28608, United States
[2] Physical Sciences Library, Cornell University, Ithaca, New York 14853, United States

Integrating Information Literacy into the Chemistry Curriculum
Chapter 3, pp 57–92
DOI: 10.1021/bk-2016-1232.ch003
ACS Symposium Series, Vol. 1232
ISBN13: 9780841231757 **eISBN:** 9780841231740
Publication Date (Web): October 20, 2016

E-mail: sigmannsb@appstate.edu.

Peer-Reviewed Book Chapter



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Article

The Safety "Use Case": Co-Developing Chemical Information Management and Laboratory Safety Skills

Ralph B. Stuart[†] and Leah R. McEwen[‡]
[†] Office of Environmental Health and Safety, Keene State College, Keene, New Hampshire 03435, United States
[‡] Physical Sciences Library, Cornell University, Ithaca, New York 14853, United States

J. Chem. Educ., **2016**, *93* (3), pp 516–526
DOI: 10.1021/acs.jchemed.5b00511
Publication Date (Web): November 17, 2015

*E-mail: Ralph.Stuart@keene.edu.

Cite this: *J. Chem. Educ.* 2016, 93, 3, 516-526
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Article

Introduction to Laboratory Safety for Graduate Students: An Active-Learning Endeavor

David J. Hill[†], Olivia F. Williams[†], Dianne P. Mizzy[‡], Therese F. Triumph[‡], Catherine R. Brennan[§], Dawn C. Mason[⊥], and David S. Lawrence[*†‖⊥]
[†]Department of Chemistry, College of Arts and Sciences, [‡]Kenan Science Library, University Libraries, [§]Environment Health & Safety, [∥]Division of Chemical Biology and Medicinal Chemistry, UNC Eshelman School of Pharmacy, and [⊥]Department of Pharmacology, School of Medicine, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina 27599, United States
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Commentary

Undergraduates Need a Safety Education!

Robert H. Hill Jr.*
Battelle Memorial Institute, Atlanta, Georgia 30329, United States

J. Chem. Educ., **2016**, *93* (9), pp 1495–1498
DOI: 10.1021/acs.jchemed.5b00825
Publication Date (Web): August 4, 2016

*E-mail: roberth_hill@mindspring.com.

Cite this: *J. Chem. Educ.* 2016, 93, 9, 1495-1498
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ELSEVIER

Journal of Chemical Health and Safety
Volume 25, Issue 3, May–June 2018, Pages 17-29

Feature

Chemical safety education for the 21st century — Fostering safety information competency in chemists

Samuella Sigmann

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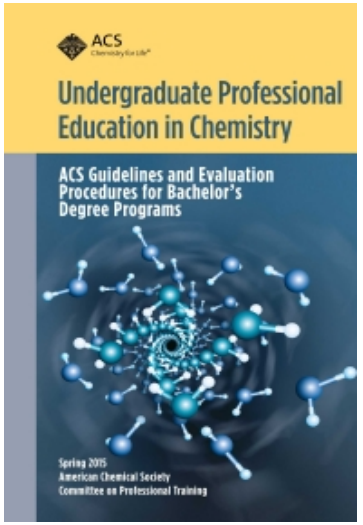
https://doi.org/10.1016/j.jchas.2017.11.002 Get rights and content

What remains to be done…

The 2015 ACS CPT Guidelines for Bachelor's Degree programs states:

"Classroom and laboratory discussions need to stress safe practices and should actively engage students in the ***evaluation and assessment of safety risks associated with laboratory experiences.*** Safety understanding and skills must be developed and assessed throughout the curriculum."

"…***recognize chemical and physical hazards*** in laboratories, ***assess the risks*** from these hazards, know how to ***minimize the risks***, and ***prepare*** for emergencies."



- Survey the chemical education landscape to determine what is being taught and how it is being taught
- Develop models of pedagogy for teaching safety
- Develop good assessments for safety learning goals
- Convince grad schools and the chemical industry to hold undergraduate programs accountable for safety learning goals
- Foster changes in faculty attitudes about safety
  - *The problem of the constant-volume and crowded curriculum*
  - *It's easier to say "no" to something when you are saying "yes" something else*

From: "Safe Science: Promoting a Culture of Safety in Academic Chemical Research"

A general culture change model:

1) Unfreezing and creating motivation for change
2) Learning new concepts and new meanings for old concepts
3) Refreezing or internalizing new concepts, meanings, and standards

CH&S culture changes:

1) Create compelling arguments for change
   - (CPT is doing what they can…)
   - (Graduate programs should assess safety qualifications of applicants)
   - (Industry should hire only applicants with proper safety background)
2) Promote the recommendations and language about safety culture
3) Hold faculty accountable for safety instruction and assessment
   - (department chairs, deans, provosts, presidents)

A Guide to Implementing Safety Culture, APLU, 2016

president/chancellor.

Appointed Institutional Lead and Leadership Team Responsible for Strengthening a Culture of Safety

Deans and Department Heads/Chairs

Environmental Health & Safety Personnel

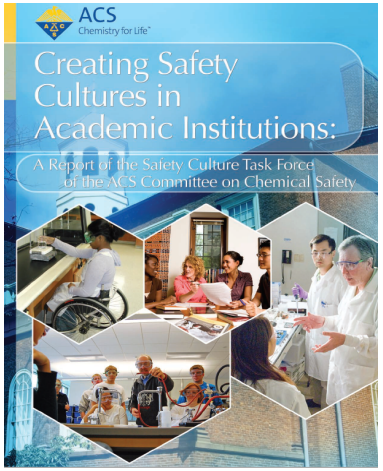
Faculty

1. Facilitate open dialogue about safety in labs, studios, and field sites.
2. Conduct a hazard analysis prior to conducting any experimental procedure.
3. Ensure everyone in the lab/studio/field site receives proper safety training.
4. Lead by example, by modeling good safety behavior.
5. Incorporate considerations of safety into scholarly work, presentations, and lab meetings.
6. Discuss lessons learned from accidents, incidents, and near misses with their research group.
7. Assume ultimate responsibility for safety in their laboratory, studio, or field site.

Undergraduate and graduate students, postdoctoral scholars, and research personnel

1. Be mindful of the potential risks to their safety and those of their neighbors in the lab, field, shop, studio, stage, and in the classroom.
2. Stop any experiment or activity that is potentially unsafe and notify the faculty supervisor.
3. Immediately report all accidents and incidents to the faculty supervisor.
4. Follow all verbal and written laboratory safety rules, including the appropriate use of personal protective equipment (PPE), regulations, and standard operating procedures required for the tasks assigned.
5. Conduct a hazard analysis prior to conducting any experimental procedure.
6. Include a hazard analysis in thesis, dissertation, and funding proposals.
7. Incorporate considerations of safety into presentations and lab meetings.
8. Discuss lessons learned from accidents, incidents, and near misses with faculty supervisor and fellow researchers.

Appendix B: Suggested Duties of Institutional Personnel



President or Chancellor (7 bullets)

Provost, Vice President, or Vice Chancellor (7 bullets)

Deans and other Administrators (7 bullets)

Department Chairs (13 bullets)

Faculty

- Implements the curricular goals for safety education;
- Ensures principle-based safety education and safety training is provided to students and staff within their laboratories;
- Ensures safety is discussed at the beginning of each research group meeting;
- Ensures new graduate students have received a principle-based safety course and specific safety training relating to their areas of research;
- Participates in the development of the Chemical Hygiene Plan (CHP);
- Works with the CHO in documenting the safety training of laboratory members;
- Documents all safety training that individual employees and students receive;
- Serves as a safety advisor and mentor for staff and students who work and study under their supervision;
- Enforces all health and safety practices, protocols, and rules within his or her laboratory space;
- Ensures the appropriate personal protective equipment is available and used by all personnel in the laboratory;
- Reviews new laboratory procedures for potential risks;
- Ensures all visitors (including vendors and contractors) follow the safety rules;
- Ensures all laboratory incidents are reported to the chair; and
- Reports promptly any facility problem or improperly functioning equipment to the appropriate office or individual.

Staff (8 bullets)

Chemical Hygiene Officer, Departmental Safety Officer (9 bullets)

Safety Council (campus-wide) (6 bullets)

Safety Committees (7 bullets)

Department Review Matrix of Safety Culture Task Force Recommendation List

9/3/12

D = department task; C = CHO task; U = University task

. . . . . Action/Status . . . . .

Recommendation	*Comment*	*D*	*C*	*U*	*Address*	*Improve*	*OK*
1. Establish the **lines of authority** for safety; develop a **safety policy** that includes laboratory safety, and includes **safety responsibilities** in the job descriptions and performance plans of all employees.							
2. **Encourage every leader** to become a proponent of safety and safety education, and to demonstrate this care for safety in their actions with other staff members and students.							
3. Establish a strong, effective **safety management system** and safety program for the institution, including laboratory safety.							
4. Ensure **graduating chemistry undergraduate students have strong skills** in laboratory safety and strong safety ethics by teaching safety lessons in each laboratory session, and by evaluating and testing these skills throughout the educational process (Table 1).							
5. Ensure all faculty, staff, and graduate and undergraduate students involved in teaching, managing, or overseeing students in laboratory courses and sessions have successfully **completed a course in lab safety**.							
6. **Implement hazards analysis** procedures in all new lab work, especially laboratory research.							
7. **Build awareness** and caring for safety by emphasizing safety throughout the chemistry curricula.							
8. Include safety education and training (for undergraduate students, graduate students, and postdoctoral scholars participating in proposed research) **in research grant proposals,** and oversight of research for safety.							
9. **Adopt a personal credo**: the "Safety Ethic"—value safety, work safely, prevent at-risk behavior, promote safety, and accept responsibility for safety.							
10. Establish and maintain an **Incident Reporting System, an Incident Investigation System, and an Incident Database** that should include not only employees, but also—graduate students, postdoctoral scholars, and other nonemployees.							

Faculty need to value safety more and insert this into the curriculum.

What do we need to do foster this culture change?
(We know what they need to do…)