# iRAMP: A 21st Century Model for Laboratory Chemical Safety

Ralph Stuart, Chemical Hygiene Officer, Keene State College
Leah McEwen, Chemistry Librarian, Cornell University

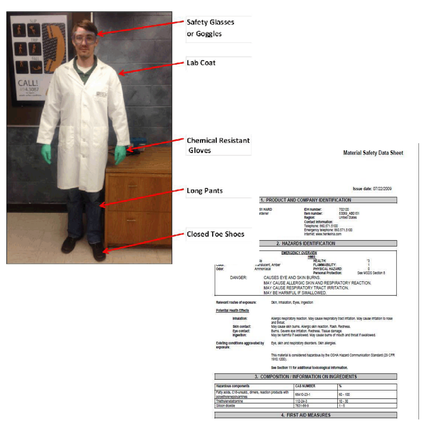
***Abstract:*** *A flexibly structured ecosystem of data, domain expertise and workflow tools is mapped to the essential connections between the research process and laboratory safety planning in academic labs.*

## The Tradition

Chemistry textbooks and laboratory manuals have treated laboratory safety as an introductory topic which involves a brief overview of rules associated with *Personal Protective Equipment*, *fume hoods* and *emergency situations*. These generic rules are followed by a statement similar to *Wikipedia's* disclaimer:

*The handling of this chemical may incur notable safety precautions. It is highly recommended that you seek the Material Safety Datasheet (MSDS) for this chemical from a reliable source and follow its directions.*

Publications from the **National Research Council, the American Chemical Society** and the National Fire Protection Association have reviewed laboratory safety incidents and found this educational approach to chemical safety in the lab  to be inadequate.




## Changing Expectations

**Documentation of risk analysis and safety planning is a key element of a laboratory safety culture.**

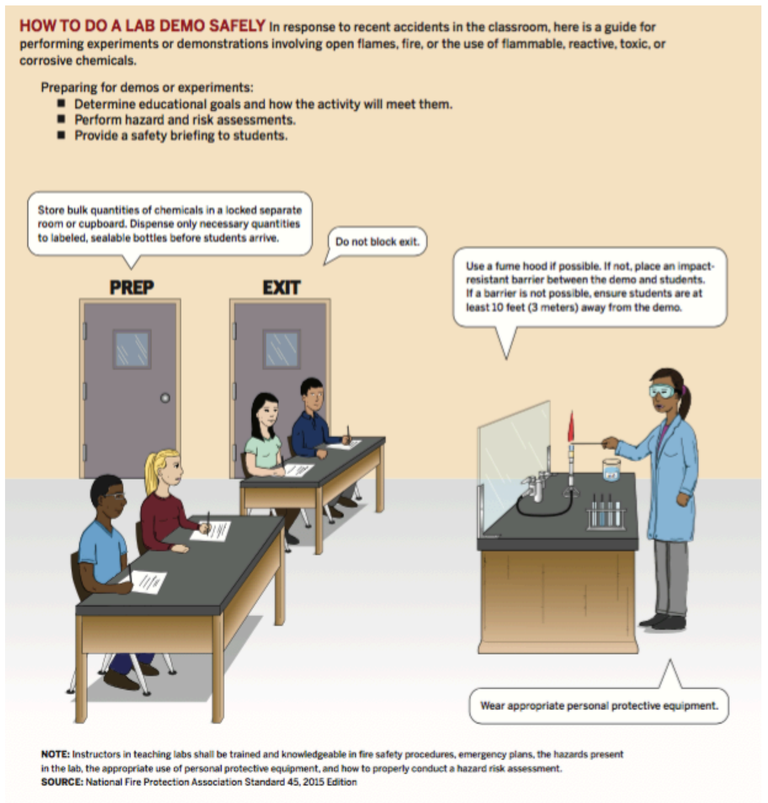
NFPA Standard 45 Chapter 12 outlines new expecations for eduational (high school) and instructional (undergraduate) labs. This standard is based on pro-active risk assessment of laboratory processes, which enables effective supervisor and institutional oversight; improves the quality of the work being conducted; and provides evidence of adherence to prudent practices if a problem arises during the work. This risk assessment can be assisted by the use of emerging chemical information technologies. The iRAMP described in J Chem Ed special issue on Chemical Information describes how this might work in the undergraduate chemistry curriculum.


Dane Neuberger, a ninth grader in Minnesota who was one of four students burned in a science demonstration involving methanol. "My face was actually on fire," he told local media. Photograph: RICHARD TSONG TAATARII/Minneapolis Start Tribune

http://www.nfpa.org/newsandpublications/nfpa-journal/2015/september-october-2015/features/unsafe-science

### Instructor Responsibilities under NFPA 45-12

- Documented hazard risk assessment
- Safety briefing for students
- Provide Personal Protective Equipment for the audience
- Safety barriers, as required
- Be trained and knowledgeable in fire safety procedures, emergency plans, hazards present

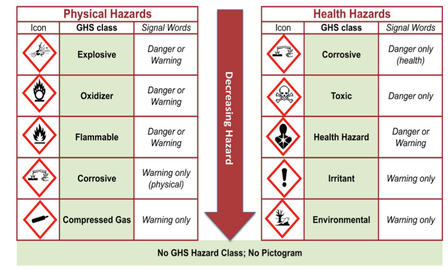



http://cen.acs.org/articles/93/i46/Make-Chemistry-Classroom-Demonstrations-Experiments.html

MArch 2016

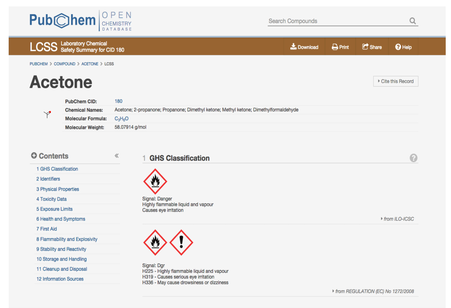
## The Emerging Model

### General Safety Information from GHS

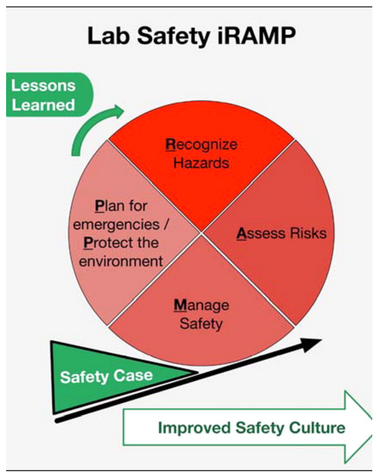



### Detailed Safety Information on PubChem LCSS

https://pubchem.ncbi.nlm.nih.gov/lcss/




### The Risk Assessment Paradigm




from ***The Safety "Use Case": Co-Developing Chemical Information Management and Laboratory Safety Skills***, Ralph B. Stuart and Leah R. McEwen J. Chem. Educ. 2016, 93, 516–526