Assessing Risk for Undergraduate Research and Demonstrations

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Abstract

Effective chemical safety education for undergraduates requires teaching risk assessment without going into excessive details about potential risks. This poster outlines 5 key questions that undergraduates should understand how to apply to their demonstration, teaching and research lab experiences.

5 Key Questions To Ask and *Answer*

In 2016, the ACS Division of Chemical Education (CHED) updated their "**Safety Guidelines for Chemical Demonstrations**". See http://dchas.org/2017/04/01/5safetyquestions/

The Five Key Questions are:

1. **What specific chemical or physical reactivity hazards are associated with the way I'm using these chemicals?**
2. **What type of ventilation do I need?**
3. **What personal protective equipment do I need?**
4. **What emergency response protocols will be needed if something goes wrong?**
5. **What will I do with the waste?**

Sigmann, S.; Stuart, R. Assessing Risk: Five Key Questions for Safe Research and Demos. inChemistry Magazine, 2016, September/October, 6-9.

These steps follow the **RAMP** paradigm. It is important to **document your safety planning to meet NFPA 45 requirements, which can be legally enforced in many places.**

- Recognize the **Hazards**
- Assess the **Risks**
- **Manage** Safety as You Work
- **Prepare** for Emergencies & **Protect** the Environment

1 What are the Chemical (health, physical, & environmental) and Process Hazards?

(temperature, pressure, incompatibilities, etc.)?

The GHS labelling elements (Pictograms, Signal Words and Hazard Statements) are the key to identifying chemical hazards associated with your work.

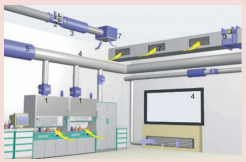
Look especially for the **"DANGER"** signal word to identify high hazard chemicals **– these are chemicals that require special planning.**

Physical Hazards		
Pictogram	GHS class	Signal Words
	Explosive	Danger or Warning
	Oxidizer	Danger or Warning
	Flammable	Danger or Warning
	Corrosive	Warning only (physical)
	Compressed Gas	Warning only

Health Hazards		
Pictogram	GHS class	Signal Words
	Corrosive	Danger only (health)
	Toxic	Danger only
	Health Hazard	Danger or Warning
	Irritant	Warning only
	Environmental	Warning only

2 What Ventilation Do I Need?

How much ventilation you need will depend on the **fire and toxicity** hazards are associated with the demonstration or experiment.



The room ventilation choices are:

1. No Lab Ventilation* Required (0-3 air changes/hour)
2. General Lab* Ventilation (6 or more air changes/hour)
3. Local Ventilation or Fume Hood (>40 ACH for gasses)
4. Outdoor Settings (variable air changes, dependent on wind speed and direction)

* Lab ventilation means that there is no air recirculated

3 What PPE Do I Need?

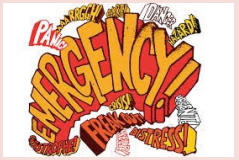
Selecting Personal Protective Equipment (PPE) requires balancing three factors:

1. The hazards of the chemicals being controlled
2. The scenario of concern (the environment)
3. The fit of the PPE on the person using it

According to the NFPA, PPE is not only for the presenter, but for any audience members who are within 10 feet of the demonstration.

4 What Emergencies Should I Plan For?

- **Fires**
- **Medical Emergencies**
- **Hazmat Spills**
- **Unexpected Crowd Actions**



Planning Tips

- ✓If anyone is in danger, call 911 for assistance
- ✓Be sure that the demonstrator appoints a "safety officer" to take control should an unplanned incident occur
- ✓If your emergency plan includes a fire extinguisher, be sure to have hands on training before the event
- ✓Ensure the spill kit is stocked with appropriate materials
- ✓Make sure Exits are accessible

5 What Will I Do With Wastes?

It is important to check with the host of the demonstration before the event to know what waste streams they are prepared to accept

Consider These Wastes:

- Chemicals
- Biological materials
- Contaminated lab materials
- Broken glassware
- General trash & recycling