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The Laboratory Safety Institute
45 Years | 1978-2023

SPEAKING OF SAFETY

Empowering Safer Science™

COOKING WITHOUT A RECIPE

The Role of Safety in Inquiry-Based Learning

ALSO IN THIS ISSUE

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COOKING WITHOUT A RECIPE

The Role of Safety in Inquiry-Based Learning

High school science labs used to offer little more than a well-rehearsed cooking show: Add some of this, sprinkle some of that, stir over medium heat and observe the results. It was predictable. It was controlled. It was an administrator's dream.

While the old-school model may have been great for producing recipe-following line cooks, it did little to develop the next generation of science innovators—the creative chefs of the STEM world.

Enter inquiry-based learning, which has exploded onto the STEM scene in the last decade. Instead of memorizing formulas and replicating known results, students engage in activities that more closely mirror actual scientific work. They ask their own questions, design their own experiments, and seek answers through hands-on exploration and creative problem-solving.

Inquiry-based STEM is not just cool and popular—it's also required in most states. According to the National Science Teaching Association (NSTA), nearly all 50 states and the District of Columbia have either wholly adopted Next Generation Science Standards (NGSS), which include the inquiry-based approach, or have created standards similar to it.

However, not all teachers are comfortable going script-less in the lab. While they want their students to feel the thrill of exploration and discovery, worries over safety and liability have become a recurrent topic in recent Laboratory Safety Institute discussions with educators.

"Obviously, no one is advocating for setting high school students loose to free-explore with hazardous chemicals," says Elizabeth Braun, Ph.D., director of educational content at the Laboratory Safety Institute. "On the other hand, retreating from hands-on lab activities altogether doesn't help anyone learn to practice science safely."

The key is guiding students to explore safely and helping them appreciate why safety rules need to be followed, Braun says. Rather than limiting exploration, she suggests equipping students to explore responsibly by embedding safety principles in science curricula from the start. "We need to integrate safety lessons into every activity at every grade level, so that by the time students enter the working world, things like risk assessments and safety meetings are automatic and innate," she says.

Elementary school students could begin with age-appropriate lessons on identifying risks and understanding basic safety principles, such as the importance of protective gear or careful handling of materials. **(continued page 4)**

IN THIS ISSUE

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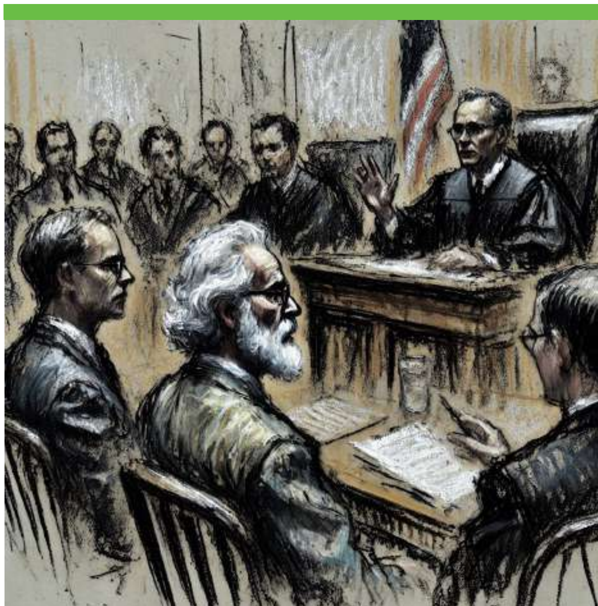
(Continued) By middle school, these lessons expand into discussions of risk assessment—identifying and evaluating the potential impact of hazards. By high school, safety should be fully integrated into all lab activities. Students should be able to design complex experiments while considering the safety implications for themselves, their peers and the environment.

THE FUTURE OF SCIENCE EDUCATION

When safety permeates the entire science education journey from the start, it becomes second nature (not just an extra box to check), and this has ripple effects beyond the classroom. As they begin their careers, students raised with safety mindset will more easily adapt to the rigorous safety protocols of industrial labs. Ultimately, they will bring a set of ingrained safety practices with them throughout their professional and personal lives.

And when students are confident in their ability to manage risks, they feel freer to take intellectual risks—posing bold hypotheses, exploring uncharted ideas, and pushing the boundaries of what's possible.

It's clear that the future of STEM belongs to inquiry-based learning. But encouraging exploration does not mean compromising safety. By integrating safety as a foundational skill, we're not just preparing students to work safely today—we're equipping them to lead the innovations of tomorrow.



Lab Safety: WHO IS REALLY RESPONSIBLE?

The short answer is "everyone." Everyone should feel personally responsible to ensure a safe working environment for themselves and their colleagues.

In legal terms, the short answer is also "everyone." While the lab staff directly involved with the incident may bear primary responsibility, the notion of ultimate responsibility means that everyone, including instructors, department chairs, deans, and even university presidents can be sued if there is an injury or a serious violation of safety regulations.

"Now whether they're going to end up getting fined or found guilty of something hard to say. Usually the money just comes from the deepest pockets," said Jim Kaufman, Ph.D., founder of the Laboratory Safety Institute, who has been an expert witness on numerous cases over 40 years, speaking at a recent webinar on the topic.

An often-cited example is Sheri Sangji, a 23-year-old UCLA researcher who died from burns suffered in a lab accident involving tert-Butyllithium in 2008. In 2012, the Los Angeles district attorney filed felony charges against Patrick Harran, who was an endowed chair of organic chemistry at the time of Sangji's death. While Harran avoided jail through community service and a donation to a burn center, the incident cost UCLA nearly $4.5 million in legal bills.

THE LEGAL RISKS OF IGNORING SAFETY PROTOCOLS

While most universities provide some liability protection, faculty and staff can still be sued individually. For this reason, it is important for each employee to document safety concerns in writing so that if an accident occurs, there is evidence of personal attempts to address the issue. It is also a good idea to read institutional insurance policies and consider purchasing personal liability insurance if necessary.

MANAGING OVERCROWDING AND UNSAFE LAB CONDITIONS

A particularly thorny challenge when it comes to legal responsibility is the issue of overcrowded labs. National Fire Protection Association (NFPA) guidelines recommend 50 square feet per person in educational labs, yet many institutions pressure instructors to increase class sizes beyond this limit, citing budget and space constraints. One university faculty member even found himself in a haggling match with administration over class size. ("OK, we can't do 8, but will you settle for 12?")

Feeling afraid to speak up, some teachers just accept the additional students and hope that nothing goes wrong. Except when something does go wrong, it's often the teacher who gets blamed. Instead of getting backed into a corner, here are some strategies that have worked for some educators:

- Keep the number of students in the lab to a minimum by **splitting the class into smaller groups,** with part of the class doing the lab activity and another part observing, writing a report, or doing something else.

- **Use less hazardous chemicals and procedures** to reduce the chances of serious injury due to an overcrowded classroom.

- **Play hardball.** Formally notify administration in writing about the dangers. Kaufman relates: "Whenever his class became overcrowded, one physics teacher kept a letter ready to send to administration that stated: 'Having 25 students in my class is an unsafe condition. Please reassign this student to another class.' When an administrator inevitably called back, the teacher would say, 'Now that I've informed you in writing about this unsafe condition, please just let me know in writing that you want me to do this anyway, so that if there's an accident injuring a student, I can present your letter in court as evidence that I tried to prevent this from happening.' He's never had an overcrowded classroom since then."

TAKING ACTION: WHAT CAN LAB PERSONNEL DO?

For those struggling to get administrative support for lab safety improvements, here are some practical suggestions:

- Bring in an external safety review, such as through OSHA's consultation service, which offers free, no-penalty safety inspections.
- Gather support from other institutions by forming a coalition to push for higher safety standards.
- Invite legal and safety experts to present workshops for university leadership.

FINAL THOUGHTS

If safety is always someone else's job, it ends up being no one's job. Faculty, administrators, and institutions must work together to foster a culture of safety and accountability.

THE ROLE OF LAB SAFETY AGREEMENTS

Many institutions require students to sign lab safety agreements, but not all agreements include explicit consequences for violations. The most effective agreements ensure that students:

- Read, understand, and acknowledge the rules.
- Agree to follow safety protocols.
- Realize that non-compliance can result in loss of lab privileges.

When faculty also signs the safety agreement, it reinforces the expectations for everyone and demonstrates leadership by example.

CHEMICAL DEMONSTRATIONS

The Good, the Bad, and the Ugly

—By Special Guest: David Katz

A lecture on pneumatics at the Royal Institution, London. Coloured etching by J. Gillray, 1802. Attribution-NonCommercial 4.0 International (CC BY-NC 4.0). Source: Wellcome Collection. https://wellcomecollection.org/works/v5g3fedh

Chemical demonstrations are a part of the history of chemistry. These were often ticketed events held at scientific institutions, such as The Royal Society in London (pictured above), or at universities.[1] Some demonstrations were safer than others, however, audiences loved fire, smoke and explosions that were part of the "show".

Unfortunately, when a chemist or chemical educator brings demonstration materials into a classroom or lecture hall, the immediate reaction of the audience is: "What are we going to blow up today?"

This article series will review the history of some science demonstration accidents and provide some guidelines for safe and successful demonstrations and hands-on activities.

THE BAD

These are a few of the accidents that have occurred in past years.

- On Sept. 3, 2014, a demonstrator at a museum in Reno, Nev., was attempting to create a colored "fire tornado" when she poured methanol from a 4-L container onto a smoldering cotton ball. Thirteen spectators, mostly children were injured. [2]

- On Sept. 15, 2014, a teacher at a high school in Denver was demonstrating flammable properties when he poured methanol from a 4-L container onto an open flame resulting in burns to four students and seriously injuring a fifth student.[3] That teacher was eventually fired.[4]

- On Oct. 20, 2014, a Cub Scout group trying to produce a green flame poured methanol—containing antifreeze from a 355-mL bottle onto a fire in Raymond, Ill.[5] Three Cub Scouts and a parent suffered burns to their faces, hands, and arms.

- On Oct. 31, 2014, high school students in Chicago were also using methanol to create a green flame inside a pumpkin when it exploded.[6] At least one student was injured.

- In April 2015, a teacher in the UK demonstrated the burning of liquid methane by pouring it onto the floor of the classroom.[7] Fortunately, no one was injured.

- Calais Weber was 15 years old when her chemistry teacher poured methanol from a 4-L bottle onto an open flame during a flame test demonstration in 2006. Weber suffered burns over 40% of her body.[8-10] "I came very close to dying from my injuries," Weber said at an Oct. 30 press briefing about CSB's new safety bulletin. "My greatest fear is that eventually there will be a child [who] won't be as lucky as I was to have survived." On chemical demonstrations, Ms. Weber takes a harder line than CSB. She said: "It is my belief that until there exists a standard mandatory protocol for training all science teachers, there is no reason for methanol to be used in classrooms. My education and love for chemistry were not fostered by seeing a demonstration in person, and it would not have been hindered by simply watching a video of it being performed in a controlled setting by trained chemists"

There are many more such accidents and injuries summed up by Samuella B. Sigmann in an article in the Journal of Chemical Education.[11]

REFERENCES:

1. Scientific Researches!—New Discoveries in PNEUMATICKS!—or—an Experimental Lecture on the Powers of Air. Published May 23, 1802 by H. Humphrey, St. James's Street. For more details go to James Gillray (1757-1815) "Scientific Researches!—New Discoveries in PNEUMATICKS!—or—an Experimental Lecture on the Powers of Air,"
2. Reno Museum Chemical Accident Hurts 13, Mostly Kids, U.S. NEWS, Sept 3, 2014. See a video of the accident at https://www.facebook.com/krnvnews4/videos/10152430320603043/
3. Chemistry lab fire burns students at Denver School, The Denver Post, September 15, 2014, https://www.denverpost.com/2014/09/15/chemistry-lab-fire-burns-students-at-denver-school/
4. Teacher Fired For Role In Lab Accident That Burned Students, $CBS Denver, October 7, 2014, https://denver.cbslocal.com/2014/10/07/teacher-fired-for-role-in-lab-accident-that-burned-students/
5. Cub Scouts, parent hurt in chemical explosion in Raymond, The State Journal-Register, October 21, 2014, https://www.sj-r.com/article/20141021/news/141029903
6. Exploding pumpkin in chemistry class injured Noble Charter students: suit, FOX32 Chicago, October 29, 2015, https://www.fox32chicago.com/news/exploding-pumpkin-in-chemistry-class-injured-noble-charter-student-suit
7. Going down in flames! Chemistry teacher wows class by setting fire to classroom FLOOR during experiment, Jake Polden for mail online, Daily Mail.com, April 9, 2015, https://www.dailymail.co.uk/news/article-3031819/Chemistry-teacher-wows-class-setting-floor-fire-experiment.html
8. Burned alive: Survivors' story of the Western Reserve Academy lab accident, Celeveland.com, Originally posted January 7, 2008, Updated March 20, 2019. https://www.cleveland.com/metro/2008/01/burned_alive_survivors_story_o.html
9. Two Massachusetts Students Get $18.9 Million Personal Injury Settlement For Burn Accident Caused By Chemistry Experiment, Boston Injury Law Blog, January 25, 2008, https://www.bostoninjurylawyerblog.com/two_massachusetts_students_to/
10. Kemsley, Jyllian, For Chemistry Demonstrations, CSB Recommends Stricter Controls, C&EN, October 31, 2014, https://cen.acs.org/articles/92/web/2014/10/Chemistry-Demonstrations-CSB-Recommends-Stricter.html
11. Sigmann, Samuella B., Playing with Fire: Chemical Safety Expertise Required, , J. Chem. Educ. 2018, 95, 10, 1736-1746, July 13, 2018. https://pubs.acs.org/doi/full/10.1021/acs.jchemed.8b00152

David Katz, Professor of Chemistry at Pima Community College in Pima, Ariz., is the winner of the 2009 Helen M. Free Award for Public Outreach. From developing some of today's most common classroom chemistry activities to giving live demonstrations before international audiences, Professor Katz has been a leader in performing chemistry outreach and enhancing the public understanding of chemistry for over 30 years.

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Lab Safety News Tracker

CYCLOHEXANOL EXPOSURE AT OKLAHOMA CHRISTIAN UNIVERSITY SENDS 13 TO HOSPITAL

A hazmat-related incident sent 12 students and an instructor to the hospital on **October 24, 2024**. Fire and medical crews responded after multiple people reported breathing difficulties following a lab class. Investigations revealed that students had been experimenting with cyclohexanol, a flammable, toxic liquid.

EXPLOSION INJURES STUDENT IN CITY COLLEGE OF NEW YORK SCIENCE LAB

A chemical explosion occurred **November 6, 2024** in a science lab at City College, injuring one person. Upon arrival, police found that a student had been mixing chemicals which led to the explosion. No further details have been released.

NITROGEN DIOXIDE EXPOSURE AT CONNECTICUT HIGH SCHOOL

On **November 13, 2024**, a teacher at Berlin High School in Connecticut was conducting a science experiment involving the use of nitric acid and copper pennies in a closed-loop system designed to produce nitrogen dioxide. However, a malfunction in the setup caused a tube to break, releasing gas into the air. The teacher and a student were hospitalized due to exposure to the fumes.

OHIO HIGH SCHOOL TEACHER INVITES STUDENTS TO TASTE AMMONIA

On **November 18, 2024**, a teacher at Perrysburg High School in Ohio mistakenly used ammonia instead of vinegar in a demonstration and then invited the students to taste the resulting mixture. Some students were advised by Poison Control to seek further medical attention as a precaution. The teacher was placed on administrative leave.

CUSTODIAN FOUND DEAD FROM CARBON MONOXIDE IN SYRACUSE

Code enforcement officials issued eight violations to the Syracuse Academy of Science Charter School, where a custodian was found dead from carbon monoxide on **January 6, 2025.**

These headlines are only the tip of the iceberg. According to researchers, the U.S. faces almost daily hazardous chemical accidents.

Four students from Hanyang University in South Korea have been honored with the 2024 Ministry of Science and ICT Award for Laboratory Safety Content and Best Practice. Their systematic approach and innovative ideas for lab safety earned them high praise.

Professor Lee Seung-hyun highlighted the significance of the award, stating, “Recently, disaster prevention and safety have become national concerns. . . . In this context, I believe this award was a great opportunity to raise awareness.”

Reflecting on the challenges of the project, Kim Ji-Yoon, a student at the Department of Chemical and Molecular Engineering, ERICA Campus, said, “writing the report was the hardest part. It took a long (time) to find safety regulations and laws that are newly updated. I thought that instructions were more accessible for safe experiments by lab workers.”

The Laboratory Safety Institute appreciates the South Korean government's commitment to lab safety and congratulates the four students for their achievement.

Source: https://www.newshyu.com/news/articleView.html?idxno=1017012

LABORATORY SAFETY GUIDELINE #14

Do Not Allow Experiments to Run Unattended Unless They Are Failsafe

Watch LSI's whiteboard animation "Do Not Allow Experiments to Run Unattended" on YouTube.

There are surely going to be times when experiments must continue running on their own while you do other things (go out to lunch or home to sleep). At these times, it's important to consider all the things that could go wrong in your absence and to prepare for them.

WHY IT'S IMPORTANT

What would happen if there were a power or compressed air failure and the stirrer were to shut down? What if the water gets turned off or a cooling hose detaches? (Cooling hoses need to be clamped or wired on.)

What about the water shut down? Do you need a special sensor for water, temperature, pressure, fluid level, etc., to control the experiment in your absence?

WHAT TO DO

The name, address, and phone number of the person responsible for an experiment should be prominently displayed. In addition, clear directions should be provided on how to safely shut down the experiment in your absence. Special hazards and precautions should be noted. Your experiment shouldn't become someone else's land mine.

Some organizational policies specify that any unattended experiments must be set up in such a way that they are "failsafe," meaning they automatically shut down if a failure occurs rather and create a runaway situation such as overheating or over-pressurizing.

— Jim Kaufman, Ph.D.

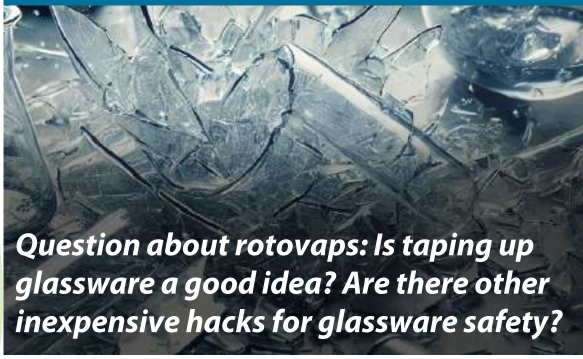
Jim Kaufman originally wrote Laboratory Safety Guidelines while he worked for the Dow Chemical company to share with schools, colleges and universities industry-tested lab safety principles.

Since then, Dow (1986), Fisher Science Education (1989), Carolina Biological Supply (1994), Fisher Safety (2012), Workrite (2017) and SCAT-Europe (2019) have produced co-branded editions of the guidelines in various poster formats. These guidelines have been translated into 22 languages, plus English Braille!

In each issue of *Speaking of Safety*, we publish an article expounding on one of the guidelines. The entire collection of revised and expanded guidelines is available in a 50-page booklet on labsafety.org.

Loose Threads

Rotary Evaporator Safety and Glassware



Question about rotovaps: Is taping up glassware a good idea? Are there other inexpensive hacks for glassware safety?

Glass can be deadly. At 25, Dennis Park had started his career working for Thiokol Chemical in Elkton, Maryland. He was using a rotary evaporator, and he had in the rotating flask a reactive material. He put a shield in front of the setup, but when he went to take the flask off the evaporator, he pushed the shield out of the way, and in that instant, the contents of the flask exploded, and a glass fragment slit his throat and killed him. The face shield that could have saved his life was found sitting less than 10 feet away. He left behind a 6-month-old daughter and a spouse.

This incident vividly illustrates that the most important factor in lab safety is usually choice, not cost. In Park's case, the necessary PPE was already purchased and available. It was simply a matter of making the choice to put it on.

MITIGATING GLASSWARE HAZARDS

Glassware safety starts by taking stock of all the glass under pressure (positive or negative) in your lab: vacuum reactors, vacuum desiccators, filtration flasks, NMR sample tubes—most people have more glass than they realize.

Once you know where the hazards are, you can start mitigating them. Once again, the most important factors are also the least expensive.

Questions, answers, and comments are taken from LSI's mail, email, phone calls, and [internet discussion list, LABSAFETY-L.]

Carefully inspect all glassware before use for chips, scratches, cracks and irregularities. There are three types of glass commonly used in labs: flint glass, borosilicate (commonly known as Pyrex), and quartz. Know the properties and tolerances of each type and make sure that the kind of glassware you're using can withstand the heat, cold, or pressure you're subjecting it to.

Next, make sure that there are protections in place to prevent injury in the event of a mishap. Once again, this is inexpensive. As the questioner mentioned, one way to help keep fragments contained in the event of an explosion is to "dress" the glassware with electrical tape in a crisscross pattern. In addition, lab vendors offer plastic-coated glassware, mesh jackets, and portable shielding barriers. Proper PPE includes goggles with side shields, face shields, lab coats, aprons and gloves.

Glassware shows no mercy, so most important is constant vigilance. Barry Sharpless, a two-time Nobel Prize for Chemistry winner, experienced a tragic lab accident early in his career. His postdoc was performing a sealed NMR tube experiment, a process that involves evacuating and sealing a thin-walled glass tube with a torch. A flaw in the tube allowed air to enter, creating a dangerous pressure buildup.

Sharpless had taken his goggles off and was getting ready to leave when his postdoc excitedly handed him the sealed tube, exclaiming, "I did it!" Just as Sharpless realized there was too much liquid inside, it exploded in his face, causing him to lose sight in one eye permanently and temporarily in the other. Years later, despite this devastating injury, a photo surfaced showing him in a lab without eye protection.

Most serious injuries are seriously preventable. No matter how experienced we are, we need to constantly remind ourselves and our colleagues of the dangers. —Jim Kaufman, Ph.D.

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