



## Creating a culture that values safety

By Humaira Taz

Lab safety tends to be an extremely underrated concept to many students, either because they do not understand the gravity of the consequences of not following all necessary precautions, or they think being careful might prevent issues, even if they don't know the hazards related to chemicals they are handling. If you don't spill the chemical then you don't have to worry about anything, right? Lab safety is an issue that academia constantly pushes to improve and that industries consider a top priority. In 2013, *MRS Bulletin* published an article<sup>1</sup> by Gary Messing, then head of the Materials Science and Engineering (MatSE) Department and founder of the MatSE Department Safety Committee at The Pennsylvania State University (PSU), which discussed initiatives taken by the university since 2008 in collaboration with industry to improve their lab safety culture. Ten years later, where are they now?

“We have a completely different safety culture now. It's not perfect, but it is night-and-day different from our past system before 2008, and it's likely much different than most academic labs. The students are more attentive to safety, and there are no surprises or hurt feelings when safety issues are raised. The faculty is on board. The administration is on board and pushes safety independently of the research

groups,” commented Michael Hickner, a professor in the MatSE Department and a Corning Faculty Fellow at PSU. John Mauro is currently the faculty head of their safety committee, while Scott Henninger, facilities representative, and Elizabeth Kupp, associate research professor in the MatSE Department, are the staff heads.

A discussion with Kupp revealed a lot about how the university has brought about this change. Before 2008, it was difficult to get students to even wear safety glasses. Now that baseline has moved up. In the MatSE Department at PSU, all undergrads must take a materials science safety training course. In addition, 10% of their grades in lab courses are assigned around safety training, thus integrating them into the safety culture from an early stage. Graduate students who are the safety managers of their labs have the option to take a one-credit-hour course; this also gives them a competitive edge in industry as leaders in safety. According to Kupp, students are held to a high safety standard in the materials science community at PSU—to the point that their card access to buildings might be revoked if their behavior shows negligence in terms of the safety of people around them. “Peer counseling is highly encouraged. If you see something, then say something. There is an anonymous online

platform too for students to report instances related to safety,” said Kupp. Because there is a wide spectrum of students—starting from new graduate and undergraduate students to those who have had exposure to safety standards in industry—the aim is to constantly establish that everyone should contribute to their colleagues' safety. Hickner said that the challenge often is the pace at which students circulate through the labs and ensuring each person is up to date with safety practices.

Although initially the boost in safety came from a collaboration with The Dow Chemical Company, PSU alumni in different industry positions have also contributed as advisors to bring up safety standards. Environmental, health, and safety (EHS) requires everyone to have a one-time laboratory safety training followed by annual refresher sessions. In addition, the Materials Research Institute and several departments jointly hold an annual safety week at the beginning of each fall semester that includes training for new people and a refresher session for current ones. The department also conducts “safety Olympics” for students to learn about safety in a fun, competitive way. Throughout the year, they post flyers on safety as constant reminders. Mauro also mentioned that the department is investing in safety research that studies the causes and trends of workplace accidents. A paper<sup>2</sup> was recently published using data from the US Bureau of Labor Statistics to look at the physical basis of workplace accidents via self-organized criticality. The results showed that “in order to reduce the rate of major accidents and fatalities, a workplace culture needs to be advanced that addresses all accidents, not just the most severe ones.”

Many other university departments, such as the chemistry departments at the University of Minnesota and University of California, Santa Barbara, have been inspired by the initiatives at PSU. Northwestern University has had its own share of improvements in safety culture since Michael Blayney joined the staff as the Executive Director of Research





Safety. From 2013 to 2015, he led a program called “The Great Clean-Up,” where the objective was to clean up expired/unused hazardous waste and obsolete lab equipment. In an invited talk at the 2017 American Chemical Society (ACS) meeting in Washington, DC, he said, “The bottom line with old waste is that it is simply an unfunded budget item—invest in remediation. And when necessary, gently remind your budget officers that whether we planned for the expense or not, somebody booked the liability. I encourage every research institution to make the scientific equipment recycling program work—you will free up space—and be more successful.”

Blayney also stressed the importance of explaining to students and faculty the science behind safety, and that the measures exist to help them. It is not uncommon to see safety programs that are slow to be accepted and enforced. In his ACS talk, Blayney also touched on this issue: “It is very critical to recognize why safety programs get stuck. You can provide better access to equipment, better building designs, but at the end of the day, you must explain to people that these measures are there so that they can be better protected and helped. Once they understand how they are being helped, they listen better.” He commented that the general safety culture is gradually changing also because of younger faculty who tend to be more environmentally conscious.

Another crucial factor Blayney highlighted was lowering barriers to safety. He showed that if departments invest in basic personal protective equipment (PPE), such as lab coats and safety glasses, a significant amount of expenses related to insurance from workplace injuries can be avoided. This is critical since Northwestern, a private institution, uses their endowments to pay for all medical expenses on the front end, which means that even minor medical issues can pay for a large amount of PPE.

Therefore, their risk management strategy heavily relies upon injury avoidance. The Office for Safety Research is developing a more user-friendly and effective platform for lab safety reviews to make the process easier. In addition, the university holds drills with the local fire department to train people on how to respond to emergency situations.

Northwestern University is collaborating with many other schools, called the “Safety Training Consortium,” to develop common research safety training fundamentals courses. The member schools all have access to the training materials, which are contributed by experts in the different schools. The objective is to provide the courses to the widest possible audience at the lowest cost. To change a culture is difficult, but Blayney is well on his way to making that change: “To instill a priority for safety in the workplace, it is also important to have skilled, knowledgeable people leading the field. Too many programs remain the way they are because no one is willing to undertake the work to make them right. Making things right makes them so much better in the long run.”

The student body at Northwestern University also started the Research Safety Student Initiative in November 2017, after a trip to DowDuPont Inc. in October of the same year. This was inspired by a similar initiative at the University of Minnesota’s Chemistry Department.

Views on safety culture in the lab remain the same on an international level as well. Kerolés Riad, a graduate student at Concordia University in Quebec, Canada,

described how he was able to take a course on “designing a hands-on safety training by working closely with champions from [their] EHS department.” The students in the course were asked to design an experiment and write a Standard Operating Procedure (SOP) with safety in mind. At the end, they were asked to conduct an experiment based on their SOPs, at which point the participants realized points of safety they had failed to anticipate. Riad said that although the course was hugely popular, it was never re-offered due to an understaffed EHS group, demonstrating that a top-down approach is very important to establish a safety culture. This goes back to what Hickner said about his experience at PSU: A top-down system matters with bottom-up support, and everyone needs to pitch in to prevent issues from falling through the cracks.

Regardless, the wave of change in lab safety culture in academia has begun and is building momentum. In addition to ensuring safety of the people involved, lab safety programs also ensure the environment is protected. Thus, it is critical for students and faculty to have a relationship with their safety officers and EHS that is based on trust, communication, and honesty.

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**References**

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2. J.C. Mauro, B. Diehl, R.F. Marcellin Jr., D.J. Vaughn, *Physica A*, **506**, 284 (2018).

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