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TEACHING CHEMISTRY SAFETY: A PERSONAL ISSUE

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As chemistry teachers, it is our moral and legal duty to make the laboratory a safe and healthy place for our students. However, safety policies will be most effective if the students share the responsibilities for promoting safety and preventing accidents. We can help to motivate our students to remember and apply safety principles if we make safety a personal issue for each student. I have found that a student will more readily comply with laboratory rules on a regular basis if the rules are important for *that* student, and *that* student has actively participated in the safety learning process.

ESTABLISHING THE VALUE OF PERSONAL SAFETY

Students have a greater respect for safety information if it applies directly to something they believe is important. The following simple lab rules provide a starting point for presenting student safety instruction in language that helps to make safety more important on a personal level.

1. Take care of your body. Chemicals will damage your eyes, so wear safety goggles. Tie back long hair and beware of freshly-applied mousse and hair spray on bangs. (Many products are alcohol-based, and alcohol ignites very easily.) Burned hair does not smell good and is very unattractive. Don't apply make-up in the lab. You may have chemicals on your hands which would burn your skin or make it break out. For the same reason, it isn't safe to eat or drink in the lab. Be sure to wash your hands with soap before leaving the laboratory. Don't poison yourself.

Lab aprons and gloves keep you from burning holes in your clothes or hands. Learn how to use the fume hood; it won't do much good if the sash is wide open or you place the beakers of chemicals close to the outer edge. Know what to do in case you catch on fire, splash chemicals on your skin or clothes or get a glass cut. Be sure you know exactly what you need to do for the experiment so that the results don't blow up in your face.

2. Take care of your lab partner. Clean up chemical spills, broken glass and other messes as soon as you can so no one puts an elbow or lab report in an unsafe place. Don't point a test tube at your partner (or anyone else); you never know when it might erupt. Be sure you know what to do if your partner has a lab accident; your immediate response may prevent serious injury.

ENCOURAGING PERSONAL PARTICIPATION

Once the students believe that safety rules do have personal relevance, the next step is to help the students "own" the information. One method is to let them teach themselves (with your guidance.) Combine some of the traditional procedures of demonstrations or audiovisual materials about safety with the following methods:

1. Let the students determine the solutions to safety problems. (See samples below.) Assign a different problem to each small group of students and let them determine the best student and teacher response methods. The group solution may be presented (following teacher approval) to the entire class as a panel discussion, a live or taped skit (using safe props!) or in any acceptable manner which fits the personalities of your class and your comfort zone. Safety problems also make very good exam questions. This procedure is an adaption of "Tell Toy" from the KSAM activity guide for elementary students.

These common examples of safety problems for a chemistry class each include several safety considerations. Remember to have students prepare prevention and response procedures for both themselves and their teachers.

(a) Paul dumps the waste products from the experiment into the trash can. A few minutes later everyone notices that the paper in the can has ignited.

(b) Sarah's safety goggles are fogging up and they make her hot. She pushes the goggles up on her forehead and rubs her eyes. Her eyes begin to tear and burn.

(c) Ben is pushing a thistle tube into a rubber stopper when the tube snaps and jams into his palm.

(d) Julie pours water into a beaker of concentrated H_2SO_4 she is holding. The beaker gets so hot that she drops it, splashing strong acid over her skin, clothes and desk.

(e) Mike reaches around a bunsen burner to pick up a test tube and accidentally catches his windbreaker jacket sleeve on fire.

(f) Michelle's thermometer rolls off the lab table and breaks. Mercury and glass fly across the floor.

(g) Mike and Gloria apparently got confused and mixed the wrong chemicals. A gas that smells like chlorine is spreading all over the lab.

2. Assign a "safety squad" for each experiment. One or two students will be responsible for verbally presenting specific safety precautions (following teacher approval of the presentation) to the rest of

the students immediately before the class begins an experiment. Student-prepared safety handouts (also teacher-approved) for the experiment would emphasize the importance of practicing "foreseeability" (taking steps, in advance, to reduce the possibility of harm or injury) and limit any possible charges of negligence if an accident should occur. If assigned several days in advance, the safety squad will have time to review reference materials regarding chemical use and disposal, equipment management and other safety considerations for a particular activity.

Available reference materials could include chemical and equipment catalogs, teacher and student laboratory manuals, Material Safety Data Sheets (available from the supplier of the chemicals), the Merck Index (available for reference use at university and college libraries, many larger public libraries and some pharmacies), equipment use information provided with the equipment (have students write to the supplier if this information has been misplaced) and state or district science safety manuals. This method of learning about safety increases awareness, teaches safety research skills and provides the students with the safety instruction they need, as well as promoting communication skills.

SUMMARY

Chemistry students need to learn to work safely with the materials found in the laboratory. This concern not only applies to the chemistry course, but to the responsibilities of future work with similar materials found in the household or job situation. Many teachers have learned that we can reach the most students if we use a combination of techniques, keep the students involved in the learning process and repeat the content through a variety of methods and applications. Let's make chemistry safety a personal issue, so that safety is relevant to the well-being of each student, and let the students help deliver the information.

References

Kern, Ernest L., ed. 1991. *Physical science activities for the elementary classroom: KSAM activity guide series*. Cape Girardeau, MO: Southwest Missouri State University Center for Science and Mathematics Education.