

contracting for Safety

Making students and parents responsible for laboratory safety

MY METAMORPHOSIS INTO A chemistry teacher started off very slowly. I thought teaching chemistry was just too intimidating for a beginning teacher. Students could get hurt, and I could get sued. So, I spent several years teaching biology, Earth science, and physical science—anything to keep as far away from teaching chemistry as possible!

Eventually, I went back to school for a graduate degree and took both school law and chemistry courses before teaching high school chemistry full time. The first year, I followed the lead of several experienced chemistry teachers and through collaborative planning learned a credible repertoire of laboratory activities.

Later, with more experience, I recognized the need to update our school's chemistry laboratory safety contract. We were using a general lab safety contract suggested by the county, but the rules did not reflect the kinds of labs we were doing in the chemistry laboratory. We needed an update. Luckily, the teachers had already modified most labs to eliminate unnecessary danger to our students.

After reviewing the major lawsuits involving school laboratory injuries, the labs our chemistry students were performing, textbook safety rules, and the existing school district safety contract, I compiled a new list of safety rules for the chemistry lab. My colleagues reviewed the draft, and our principal gave his approval on the condition that we have the school district science supervisor review the rules. Once we received the supervisor's seal of approval, the chemistry teachers in our school presented a chemistry lab safety contract to students and parents in the fall of 1992.

BY ANNE B. DAVIDSON

SIGN FOR SAFETY

Explaining the safety contract and the reasons for it to students and parents was much easier than I expected. The chemistry teachers took the first few days of the term to explain the rules and walk the students through the lab. Students were shown the permanent location of safety equipment such as safety goggles, emergency showers, eyewashes, fire extinguishers, and fire blankets. The teachers compiled a list of gruesome examples of injuries that could result from not following each of the rules. Actual stories from our school did not cover all the rules, so we added narratives from major safety lawsuits. My students easily identified with other teenagers who had repeated an experiment "just one more time," and had been permanently disfigured as a result.

I told the true story of a student who stole some sodium peroxide, hid it in his pocket, and later seriously injured his hand due to the violent reaction of sodium peroxide with moisture on his skin. Sometimes mishaps caused injury to other students, rather than the person breaking the rule. Describing my disgust when my own long hair fell into a dissection tray full of mouse intestines helped students understand the rule about tying back long hair. None of my students wanted to have a bad hair day that way!

After discussing lab safety rules and the use of safety equipment, students had to fulfill two requirements before using the chemistry lab. Each student and parent had to sign and return a signed safety contract to be placed in their file, and the students also had to pass a safety quiz based on the rules.

Teaching students about safety regulations at the beginning of every term had many positive benefits. A climate of personal responsibility was established, and students realized that how they conducted themselves in



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the lab was important. Acting like goofy teenagers in a television sitcom was not acceptable. Parents were reassured that students would be held to reasonable standards of safe conduct, and students who did not want to comply with the rules had a few days to get their schedules changed before we began lab experiments.

AN EYE FOR DETAIL

Did I get challenged on some of the safety rules? Of course I did. Contact lenses in the chemistry lab were a topic of discussion every fall, and students complained about not being allowed to wear them. I explained that I had asked an ophthalmologist if there were types of lab exercises in which students can safely wear contacts and had been surprised at his response that today's contact lenses can actually trap molecules of chemicals from the air, dissolve them in the water in the soft contact lenses, and fuse the resulting product to the eye! Due to the number of students and teachers using our lab, I could not personally guarantee which chemicals might be present in trace amounts in the air at any time so I required students to remove their contacts before entering the lab. I kept a bag of new contact lens cases and wetting solution handy and allowed students who forgot their cases to use mine and replace them with new ones the next day.

After this discussion, a few students were still skeptical and asked if they could bring a note from home excluding them from the no-contact-lenses rule. I asked them if their parents would write a notarized letter to our principal stating that even though we could not guarantee the safety of students wearing contact lenses in the lab, and although an ophthalmologist had advised us against allowing students to wear contacts in the lab, their child just could not be bothered with the responsibility of removing their contacts. Therefore, the parent and child would take full responsibility for any damage or blindness caused by wearing contacts in the lab. Not surprisingly, we never received any of those letters from parents.

Consistency in enforcement of the safety rules was essential, and all the teachers in our building used the same safety contract. Chemistry teachers new to our school often scheduled their students' orientation and safety tour of the lab when a veteran teacher was present, and we shared the stories of student infractions and the unfortunate results. The contract was posted in several locations in the classroom and lab, and students became more involved by illustrating safety posters. One student decided to produce a video demonstrating some of the rules. The class was entertained by the special effects and reminded why the rules were important.

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Other area schools requested copies of our safety contract, and we compared their school rules to ours. The higher the level of consistency across the school district, the easier it was for students to accept the rules. For instance, we became more diligent in enforcing the long pants and closed shoe rules after learning that a nearby school was stricter than we were.

Throughout my years of teaching, I have had to deal with a few safety infractions. The administration had approved of our plan before the actual implementation, so the principal and assistant principals were supportive. Parents were, too. One student pulled her goggles up and rubbed her eye, causing an eye irritation that resulted in 20 minutes at the eye-wash and a trip to the emergency room. The student was not permanently injured, and her mother's comment was, "She knew better than that. You told her."

PERSONALIZING THE CONTRACT

Teachers interested in customizing a lab safety contract for their science classes should consider the important points listed in Figure 1. This brief summary of the reasons for a long list of lab safety rules is based on lessons learned from lawsuits. A clear and firm safety goggles

FIGURE 1.

Important points to include in lab safety contracts.

1. Safety goggles must be of the accepted type, and this rule must be enforced without exception.
2. Chemicals must be locked and safeguarded, from delivery through disposal.
3. Students may not remove any chemicals from the lab.
4. Teachers must supervise the lab activities at all times, and students cannot attempt experiments when a teacher is not present.
5. Teachers/schools must provide and maintain safe conditions.
6. Teachers/schools must establish regulations and procedures to assure that proper equipment is available for science experiments.
7. Alcohol burners should not be used. If alcohol or other flammable substances are used, students must be properly instructed on how to safely use substances and equipment.
8. All chemicals must be clearly labeled.
9. Teachers must teach students how to properly and safely handle potentially dangerous chemicals and/or equipment.
10. Teachers should be able to explain any explosion that takes place.
11. Students must thoroughly wash their hands after completing science experiments.

policy is of primary importance, and teachers should check with local and state regulations for further guidance. Also, it is important that goggles meet ANSI Z87.1 type G, H, or K standards for science labs. Any eye safety wear, no matter what type, must have imprinted in the plastic frame "ANSI Z87.1." Eye safety wear marked "Z87" is not suitable for laboratory work with chemicals. Also, students should never remove chemicals from the lab or attempt experiments when teachers are not present. Thoroughly washing hands before leaving the science lab is another key rule to reducing injury.

Teachers should check with their principal or district science education coordinator about local regulations because school boards and local governments may have regulations that affect each school. The handling of live animals in the classroom is one area that varies considerably across localities, and teachers must verify local regulations before doing things like sending home the class frogs.

State science safety regulations should also be available for review. Teachers may be able to find their state science supervisor's name, address, and telephone number at www.enc.org/csss/memb2.htm. Telling a student that a certain behavior, such as not wearing safety goggles in the lab, is a violation of a state law quickly eliminates unnecessary debate.

NSTA has several excellent resources to review for safety rules. *Safety in the Elementary Science Classroom* is particularly good for elementary and middle school classes (NSTA, 1997). The NSTA Position Statement on Laboratory Safety can be found on-line at www.nsta.org/handbook/labsci.htm. Another personal favorite I recommend is the *Flinn Chemical & Biological Catalog Reference Manual*. Teachers may request a copy via e-mail at flinnsci@aol.com. The Department of Chemistry University of Nebraska-Lincoln has a science lab safety website at www.unl.edu/safety. Most chemical safety information on the Internet cannot be certified by a novice as reliable, so it is important to use discretion when choosing information from unknown sources.

Teacher editions of texts and lab manuals also have good suggestions for safety rules. Having a few such references on hand can lend credence to safety rules presented to administrators, students, and parents. *The Science Teacher* has also previously published articles of interest. Good ones to start with are *Chemical Safety: Part I* (Young, 1997) and *Chemical Safety: Part II* (Young, 1997).

After reading through all these resources, it would be easy to develop a list of hundreds of science safety rules. Should they all be included in the safety contract?

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Probably not, unless the students will do every type of hands-on activity ever conceived in the history of science education. It is important to look through the compiled list and include the following in the safety contract:

- Rules required by legislation, policy, and so forth;
- Rules applicable to your classroom and lab activities; and
- Rules appropriate for the grade level taught.

Biology, chemistry, physics, and Earth science students need slightly different rules. Elementary, middle, and high school students and curricula need different rules. Classes based on the inquiry method need safety rules to ensure that students plan procedures and check with the teacher before carrying out experiments. Our chemistry safety contract had 34 rules, which is too many for some classes but not enough for others. When writing a safety contract, teachers can individualize the rules to ensure that students have as much freedom to explore the intriguing world of hands-on science as possible, while still maintaining necessary restraints.

Our safety contract worked for us. One hesitant young science teacher evolved into a much more confident and effective chemistry teacher by using a contract with students. The students quickly learned appropriate behaviors, allowing us to do more labs. I was even able to take groups of students into the field to do water analysis at a nearby wildlife refuge. In the lab, classroom, or field, there were few injuries to students, and all the injuries were minor.

One of my students did complain, "Mrs. Davidson, you are always fussing at us about safety, safety, safety." "You are probably right," I responded, "but what is the one thing worse than a science teacher who fusses at you about safety?" The student responded with a knowing nod, "A teacher who doesn't fuss at us about safety." ♦

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