Start with Safety

The ability to work with students in the lab—allowing them to observe, question, engage and discover—is one of the most rewarding aspects of any science teacher's responsibilities. It is also potentially one of the most dangerous. The purpose this article is to provide a forum for science teachers to review safety requirements and procedures, discuss their safety concerns, and set goals to improve safety. Understanding their safety roles and responsibilities will help science teachers increase safety awareness, reduce accidents, and improve science education.

General Safety Responsibilities

Science teachers owe their students a duty of care to anticipate dangers that are reasonably foreseeable and to take the necessary precautions to prevent accidents and protect students from harm. The teacher's responsibilities include the following:

- Supervising students in the classroom and lab.
- Providing adequate instructions for students to perform the tasks required of them.
- Warning students of the possible dangers involved in performing lab activities.
- Providing safe laboratory facilities for performing experiments and demonstrations.
- Maintaining laboratory equipment in proper working order.

The Flinn Scientific Student Safety Contract was developed in collaboration and consultation with experienced science teachers from all across the country. This comprehensive safety contract is available in high school and middle school versions in both English and Spanish. Visit our Web site at www.flinnsci.com, click on Teacher Resources, then Safety, then click on Safety Contracts and Safety Exams, and follow the links to download a copy of the appropriate safety contract.

The Safety Contract

The first step in creating a safe laboratory environment is to develop a safety contract that describes the rules of the laboratory that your students must follow. The safety contract is the foundation of any school science safety program. Before a student ever sets foot in the lab, the safety contract should be discussed in class and then signed by the student and a parent or guardian. Review the rules not just the first day of class, but on a regular basis. Incorporate safety into each class or laboratory exercise—begin every lab period, in particular, with a discussion of the procedures or chemicals used in the experiment and the general and special safety precautions that must be observed. Pre-lab assignments are another way to ensure that students are prepared for lab and understand the safety requirements.

Proper instruction is not just for beginning students. Imagine that you are teaching a senior biology elective—should you assume that students know how to use a Bunsen burner to sterilize an inoculating loop?

Supervision

Teachers must be physically present at all times to supervise students wherever and whenever laboratory equipment or chemicals are being used. Never leave students unattended—be prepared and remain alert to what students are doing in order to prevent accidents before they happen. The best defense is a good offense!

Proper Instruction

It is not sufficient to merely give students lab directions or procedures in the form of a handout or textbook reading assignment. Proper instruction requires that teachers explain the nature of the equipment or chemicals that students will be using and how they are to perform tasks in the lab. Proper instruction also includes demonstrating new or unusual laboratory procedures and teaching students the safe way to handle chemicals, glassware, and other equipment. Remember to record all safety instruction in your lesson plans. Being able to provide evidence of documented safety instruction will reduce your liability in the unlikely event of an accident.

Warning Students of Hazards

Teachers have a responsibility to specifically identify hazards and warn students about the possible dangers of working with chemicals or performing tasks in the lab. Consider the following chemical hazard warning: Hydrochloric acid is corrosive—avoid contact with eyes and skin. What is the first thing students think of when they hear the term corrosion? Rust! Students do not always understand the proper meaning of hazard warnings or safety precautions. Warning students requires showing the students what these words mean in the context of lab safety. Just as with any instruction, it is important to demonstrate the concepts and to assess student understanding of the safety concepts.

Maintaining a Safe Lab Environment

The school administration and science teachers share a responsibility to maintain a safe lab environment for students. The school must provide safety equipment that is appropriate for the hazards and maintain the equipment in proper working order. The science teacher's duty of care in this respect is to communicate with the administration, keep them informed about the safety requirements, recommend safety equipment, practices and procedures, and inspect safety equipment on a regular basis. All equipment and glassware must be in good working order before it is used in the lab. Inspect equipment before setting it out for student use, and remove any defective materials. Instruct students to check glassware regularly for cracks and chips, especially if glassware will be heated or subjected to pressure differences (vacuum, etc.).

Helping Students Meet Their Responsibilities

Students are required to follow all rules, guidelines, and instructions provided by the school district and their teacher. Signing the safety contract signifies that students have read the contract, understand the rules, and agree to abide by the safety requirements in the school science laboratory. The safety contract should also be signed by parents or a guardian to document that they are aware of the rules their child must follow and the potential consequences of not following them. Students have a responsibility to come to class prepared for the laboratory activity. One of the leading causes of laboratory accidents is students' failure to carefully read and understand lab instructions. Students must wear all the required personal protective equipment, including safety glasses or chemical splash goggles and chemical-resistant gloves and aprons, as instructed by the teacher.