Safety in numbers

by Ken Roy

Too often, middle school science teachers experience overcrowding in their classrooms and laboratories. Many of these teachers are concerned about how crowded conditions affect instructional effectiveness, lab safety, and teacher liability.

The National Science Teachers Association (NSTA) Safety Advisory Board recently examined this issue in two topic papers, which include general guidelines for K–12 lab work involving science teachers and their students. The first, titled "Overcrowding in the Instructional Space," was written to provide teachers with information about overcrowding and ideas for addressing the problem (NSTA SAB 2014b). The second paper is titled "Duty or Standard of Care," and it discusses teacher liability (NSTA SAB 2014a). *Duty or standard of care* is the degree of care a prudent, careful, and reasonable person should exercise in a specific situation to ensure safety. For example, as a reasonable and careful enough action to ensure students are not injured, safety glasses or goggles are required by the science teacher for lab work. Both papers are available online.

What do I need to know?

When overcrowded, the laboratory can be a dangerous place to work and learn. Teachers need to be attentive to safety in the lab given their legal liability if an accident were to occur.

"Overcrowding in the Instructional Space" contains an introductory paragraph that lays the groundwork for addressing the problem of having too many students in the lab:

"Better professional practices and academic research support hands-on, process and inquiry-based laboratory and field investigations as well as hands-on activities to promote deep conceptual understanding of science by students. To ensure a safer and effective science teaching/learning environment, the following recommendations are derived from recognized reliable sources, legal safety standards, and best professional safety practices" (NSTA SAB 2014b).

The paper goes on to mention academic research detailing the frequency of safety incidents relative to class size: As the number of students in a class increases, the number of accidents that occur also increases. It then addresses the legal term *occupancy load*, which mandates the maximum number of occupants allowed in a building or part of a building, such as a middle school science laboratory. Specific legal standards for establishing occupancy load are noted, as are better professional practices. (For example, NSTA has long advocated class sizes not exceed 24 students so that occupancy load limit for the laboratory is not exceeded.) The safety paper also provides the following summary relative to overcrowding:

Give them someone (and something) to look up to.

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"NSTA continues to recommend that:

- science class sizes in every class (not average over all classes) be limited to:
    - 24 (high school/middle school) students if there [are] at least 60 square feet [5.6 square meters]/student net in a combination of classroom/laboratory room or 50 square feet [4.5 square meters]/student net in a pure laboratory room.
    - 24 elementary students if there [are] at least 45 square feet [4.2 square meters]/student net in either a pure laboratory or combination classroom/laboratory.
    - 24 students for field trips (This will depend on the number of chaperones [students/teacher/adult ratio], safety hazards of the location, number of special needs students [number of necessary paraprofessionals], etc.)
- [schools provide] adequate workspace area for each student of at least:
    - At the secondary level, 60 square feet [5.6 square meters]/student net in a combination of classroom/laboratory room or 50 square feet [4.5 square meters]/student net in a pure laboratory room
    - At the elementary level, 45 square feet [4.2 square meters]/student net in either a pure laboratory or combination classroom/laboratory
- [classrooms] meet the requirements of OSHA, ICC (International Code Council) and/or NFPA [National Fire Protection Association], as applicable jurisdiction-wise regarding occupancy loads.
- [teachers] adhere to better professional practices of the professional organizations" (e.g., NSTA, National Science Education Leadership Association) (NSTA SAB 2014b).

Remember: It is the occupancy load that provides the legal basis for the number of people who can safely occupy a lab space—not the number of students in a class.

"Duty or Standard of Care" provides specific strategies for protecting teachers from legal entanglements relative to the many hazards in science labs and students or other employees getting injured. This safety paper goes into detail about the behaviors required of teachers to meet the duty or standard of care, including the following:

- "Notify students of safety practices and procedures—Teachers have a duty to discuss safety practices with students at the beginning of the school year, establishing the rules by which all experiments will be conducted...
- Instruct and model safety—Students pay attention to what teachers do as well as to what they say. As science teachers, we have a duty to provide safety instruction and model appropriate safety practices, such as wearing goggles, for our students...
- Warn students of hazards—Teachers must explicitly and specifically warn students of the dangers they may encounter during a laboratory activity...
- Inspect for safety—Teachers should inspect equipment prior to, during, and after laboratory activities to ensure that they are in proper working order...
- Enforce safety regulations—Teachers must also ensure that students follow all safety procedures at all times...
- Maintain equipment—Teachers have a duty to make sure that personal protective equipment and

Question of the month

Do custodians need safety training prior to cleaning the floors in a science lab?

Answer

Absolutely. OSHA requires employees to be trained via the Hazard Communication Standard when working in areas where there are hazardous chemicals (see Resources). In addition to providing training, the employer needs to have a written safety plan (see Resources for example safety plans).

Do you have a safety question?

Submit questions relative to safety in the middle school science laboratory to Ken Roy at *Royk@glastonburyus.org*.

engineering controls are operating properly and meet manufacturer's specifications" (NSTA SAB 2014a).

The paper also includes information about actual lawsuits against teachers and how duty of care was a critical component of the defense.

In the end

Science teachers need to know how to make the lab safer and how to protect themselves from litigation resulting from accidents in the science classroom. These safety papers are a must read for all middle school science teachers. ■

References

National Science Teachers Association Safety Advisory Board (NSTA SAB). 2014a. Duty or standard of care. Arlington, VA. NSTA. *www.nsta.org/docs/DutyOfCare.pdf.*

National Science Teachers Association (NSTA) Safety Advisory Board (NSTA SAB). 2014b. Overcrowding in the instructional space. Arlington, VA. NSTA. *www.nsta.org/docs/OvercrowdingInTheInstructionalSpace.pdf.*

Resources

Hazard communication program guidance (example safety plans)—*www.osha.gov/dsg/hazcom/solutions.html*

Safety in the science classroom—*www.nsta.org/safety/*

OSHA standard for toxic and hazardous substances—*www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10099*

Ken Roy (*Royk@glastonburyus.org*) is director of environmental health and safety for Glastonbury Public Schools in Glastonbury, Connecticut, and NSTA's chief science safety compliance consultant.