
Appendix XI

Safety Practices and Legal Requirements

Safe practices are integral to teaching and learning of STE at all levels. It is the responsibility of each district to provide safety information and training to educators and students and the responsibility of each educator to understand and implement safe laboratory practices. This section describes the laboratory safety practices that are required by law, as well as resources that provide guidance on general safety practices.

Duty of Care of Adults Teaching Science

As professionals, teachers of science have a duty of care to ensure the safety of students, teachers, and staff. (“Duty of care” is defined as an obligation, recognized by law, requiring conformance to a certain standard of conduct to protect others against unreasonable risk.) Accordingly, a science educator must act as a reasonably prudent person would in providing and maintaining a safe learning environment for students.*

A reasonably prudent teacher:

- Provides prior warning of any hazards associated with an activity.
- Demonstrates the essential portions of the activity.
- Provides active supervision.
- Provides sufficient instruction to make the activity and its risks understandable.
- Ensures that all necessary safety equipment is available and in good working order.
- Has sufficient training and equipment available to handle an emergency.
- Ensures that the place of the activity is as safe as reasonably possible.†

Additionally, a science teacher must be able to provide an educational justification for engaging in any activity associated with an inherent safety risk.

Legal Aspects of Laboratory Safety

Educators should be aware of the legal framework outlined below in planning for the design, construction, and implementation of science instruction, classrooms and laboratories:

Applicable Massachusetts Law

1. Safety Goggles

Wearing protective goggles in school laboratories is required by Massachusetts law.

Mass. Gen. Laws c. 71, § 55C, states:

Each teacher and pupil of any school, public or private, shall, while attending school classes in industrial art or vocational shops or laboratories in which caustic or explosive chemicals, hot liquids or solids, hot molten metals, or explosives are used or in which welding of any type, repair or servicing of vehicles, heat treatment or tempering of

* National Science Teachers Association (NSTA). (2007). *NSTA position statement: Liability of science educators for laboratory safety*. Retrieved from www.nsta.org/docs/PositionStatement_Liability.pdf

† Maryland Department of Education. (1999). Legal aspects of laboratory safety. In *Science safety manual*. Retrieved from mdk12.msde.maryland.gov/instruction/curriculum/science/safety/legal.html

metals, or the milling, sawing, stamping or cutting of solid materials, or any similar dangerous process is taught, exposure to which may be a source of danger to the eyes, wear an industrial quality eye protective device, approved by the department of public safety. Each visitor to any such classroom or laboratory shall also be required to wear such protective device.

Thus, all individuals in the laboratory are required to wear goggles if they are using any of the materials or procedures listed in the statute. It is critically important for teachers to make students aware of the hazards of working with chemicals and open flame in the laboratory and other settings and to be sure they wear goggles to protect their eyes. (Wearing protective goggles is also an Occupational Safety and Health Administration [OSHA] standard—1910.133.)

2. Treatment of Animals

Animals should be treated with care and dissection should be confined to the classroom and undertaken for academic purposes.

Mass. Gen. Laws c. 272, § 80G, states:

No school principal, administrator or teacher shall allow any live vertebrate to be used in any elementary or high school under state control or supported wholly or partly by public money of the state as part of a scientific experiment or for any other purpose in which said vertebrates are experimentally medicated or drugged in a manner to cause painful reactions or to induce painful or lethal pathological conditions, or in which said vertebrates are injured through any other type of treatment, experiment or procedure including but not limited to anesthetization or electric shock, or where the normal health of said animal is interfered with or where pain or distress is caused.

No person shall, in the presence of a pupil in any elementary or high school under state control or supported wholly or partly by public money of the state, practice vivisection, or exhibit a vivisected animal. Dissection of dead animals or any portions thereof in such schools shall be confined to the classroom and to the presence of pupils engaged in the study to be promoted thereby, and shall in no case be for the purpose of exhibition.

Live animals used as class pets or for purposes not prohibited in paragraphs one and two hereof in such schools shall be housed or cared for in a safe and humane manner. Said animals shall not remain in school over periods when such schools are not in session, unless adequate care is provided at all times.

The provisions of the preceding three paragraphs shall also apply to any activity associated with or sponsored by the school.

Whoever violates the provisions of this section shall be punished by a fine of not more than one hundred dollars.

For further discussion on the Board of Education's policy on the dissection of animals, please consult Appendix XII.

3. "Right to Know"

People who work with hazardous chemicals have a "right to know" the dangers and nature of these chemicals.

Mass. Gen. Laws c. 111F, § 7(a), states:

Except as otherwise provided by this section, an employer shall label with the chemical name each container in his or her workplace containing a toxic or hazardous substance. Said label shall also contain the proper NFPA [National Fire Protection Association] Code applicable to any contents of the container for which an NFPA Code has been published in NFPA 49, Hazardous Chemical Data, but only in those instances where the

container contains more than five gallons or thirty pounds of materials to which the NFPA Code is applicable.

Thus, laboratory managers must make sure that all posters, labels, Safety Data Sheets (SDSs), etc., describing and explaining the dangers of hazardous chemicals are clearly displayed and current.

4. Mercury

Schools are not to have mercury, including equipment or materials containing mercury, on the premises (with limited exceptions), and any mercury-added products must be disposed of appropriately.

Mass. Gen. Laws c. 21H, § 6G (as amended by Chapter 190 of the Acts of 2006, effective October 1, 2006), states:

No school in the commonwealth shall purchase for use in a primary or secondary classroom elemental mercury, mercury compounds or mercury-added instructional equipment and materials, except measuring devices and thermometers for which no adequate nonmercury substitute exists that are used in school laboratories. This section shall not apply to the sale of mercury-added lamps or those products whose only mercury-added component is a mercury-added lamp or lamps.

Mass. Gen. Laws c. 21H, § 6I (as amended by Chapter 190 of the Acts of 2006, effective May 1, 2008), states:

(a) No person, household, business, school, healthcare facility or state or municipal government shall knowingly dispose of a mercury-added product in any manner other than by recycling, disposing as hazardous waste or using a method approved by the department [of environmental protection].

Relevant Federal Law

1. Americans with Disabilities Act (ADA)

Public schools are required to comply with provisions of the ADA. Students with disabilities are entitled to a level of laboratory experience appropriate to them as individuals. The ADA was amended in 2008 to allow for coverage of a broad range of disabilities, including allergies that would substantially impair a major life activity in the absence of mitigating factors. As a result, teachers must take additional precautions to ensure that reasonable accommodations are made for students who are allergic to materials used in the science lab (see “Additional Resources” for guidance on latex allergies).

2. Occupational Safety and Health Administration (OSHA)

The Occupational Safety and Health Act requires that certain precautions be observed and certain actions taken to protect the health and safety of employees on the job. Although students are not covered by OSHA, the prudent teacher will conduct the science classroom in such a manner that the regulations are followed by all occupants. Following OSHA precautions for all classroom or laboratory occupants is good safety practice. The following topics are of heightened relevance to science teachers:

- Limiting the exposure to hazardous chemicals (1910.1450)
(www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10106)
 - Laboratory managers should have a chemical hygiene plan, ensure that the proper protective gear is used, provide training for those working in the laboratory, etc.

- Limiting the exposure to blood-borne pathogens (1910.1030) (www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051)
 - Laboratory managers should have an exposure control plan; provide hand washing facilities; ensure that lab workers wash hands right after the removal of gloves; dispose of contaminated needles and other sharp instruments in puncture-proof, non-leak containers; prohibit the application of cosmetics, changing of contact lenses, and other such practices in the laboratory; provide proper protective eye, hand, and face equipment, etc.
- Providing information about the hazardous chemicals in use in the laboratory (1910.1200) (www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10099)
 - 1910.1200(b)(1): All employers must “provide information to their employees about the hazardous chemicals to which they are exposed, by means of a hazard communication program, labels and other forms of warning, safety data sheets, and information and training.”
- Using hand protection when handling potentially dangerous substances (1910.138) (www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9788)
 - 1910.138(a): “Employers shall select and require employees to use appropriate hand protection when employees’ hands are exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns; and harmful temperature extremes.”
 - 1910.138(b): “Employers shall base the selection of the appropriate hand protection on an evaluation of the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards and potential hazards identified.”

3. Restrictions on Use of Migratory Birds

Individuals are not allowed to acquire live or dead migratory birds, nests, or eggs, or to use them as lab animals.

Under federal law, 16 U.S.C. § 703(a) states:

[I]t shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird, any part, nest, or eggs of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof, included in the terms of the conventions between the United States and Great Britain for the protection of migratory birds concluded August 16, 1916 (39 Stat. 1702)

Thus, it is illegal to acquire any migratory bird, whether alive or dead, or their eggs or nests, for any purpose, including for use within a classroom or lab.

Additional Resources

1. General Safety Advice

Several websites provide lists of general safety guidelines. (While these practices are commonly accepted, they are not officially endorsed by the Massachusetts Department of Education.)

- National Science Teachers Association (NSTA), *Position Statement: Safety and School Science Instruction*, www.nsta.org/about/positions/safety.aspx
- The Council of State Science Supervisors' safety website, www.csss-science.org/safety.shtml
- Connecticut State Department of Education, *Connecticut High School Science Safety*, www.sde.ct.gov/sde/cwp/view.asp?a=2663&q=334760
- Connecticut State Department of Education, *Connecticut Middle School Science Safety*, www.sde.ct.gov/sde/cwp/view.asp?a=2663&q=334736
- Ward's Science, www.wardsci.com/store/content/externalContentPage.jsp?path=/www.wardsci.com/en_US/teacher_resources_safety_data_sheets.jsp
- Carolina Biological, www.carolina.com/teacher-resources/lab-science-classroom-safety-information/10856.co?N=516766767&Nr=&nore=y
- Flinn Scientific, www.flinnsci.com/teacher-resources/safety/
- Laboratory Safety Institute, www.labsafetyinstitute.org/Resources.html
- National Institutes of Health, www.nih.gov/research-training/safety-regulation-guidance
- OSHA, www.osha.gov

2. Special Considerations for the Collection, Handling, and Analysis of Human Biological Material

- Safe collection and handling of samples:
 - The Centers for Disease Control and Prevention's (CDC's) Universal Precautions for preventing transmission of bloodborne infections, as well as federal regulations at 29 CFR § 1910.1030, must be followed when human samples are used in laboratories:
 - www.cdc.gov/niosh/topics/bbp/universal.html
 - www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10051
 - In addition to the Universal Precautions, teachers using human body samples should take the following precautions:
 - Students must be allowed to collect samples only with the supervision and advice of the teacher.
 - Samples must be handled with plastic or latex gloves, chemical splash safety goggles, and a laboratory coat or apron.

- Students must always wash their hands after any laboratory activity involving human body samples.[‡]
- Privacy considerations:
 - The federal Family Educational Rights and Privacy Act (FERPA) protects the privacy of student education records in general, including all of the medical information they contain (20 U.S.C. § 1232g; 34 CFR § 99). Under FERPA, schools must grant parents and eligible students the right to access student records, and must obtain consent before disclosing records. Schools must be mindful of FERPA requirements in developing policies for the handling of student medical information collected in science laboratory activities. For more information on FERPA, visit familypolicy.ed.gov.

3. Safe Handling of Plants and Animals in General

- Institute for Laboratory Animal Research, *Principles and Guidelines for the Use of Animals in Precollege Education*, www.nabt.org/websites/institution/File/Principles%20and%20Guidelines%20for%20the%20Use%20of%20Animals%20in%20Precollege%20Education.pdf
- National Academy of Sciences, *Guide for the Care and Use of Laboratory Animals: Eighth Edition (2011)*, www.nap.edu/catalog/12910/guide-for-the-care-and-use-of-laboratory-animals-eighth
- MSPCA-Angell Headquarters, *Classroom Pets: The Humane Way*, www.mspca.org/cruelty_prevention/classroom-pets-the-humane-way-2/
- American Association for Laboratory Animal Science, *Use of Animals in Precollege Education*, www.aalas.org/about-aalas/position-papers/use-of-animals-in-precollege-education#.Voqeg7YrKUK
- Massachusetts Executive Office of Health and Human Services, Department of Public Health, *Animals in the Classroom: Recommendations for Schools*, www.mass.gov/eohhs/docs/dph/com-health/school/rabies-prtcl-school.pdf
- Oregon Zoo, *Animals in the Classroom*, www.oregonzoo.org/sites/default/files/downloads/Animals%20in%20the%20Classroom_OregonZoo_0.pdf
- Massachusetts Executive Office of Health and Human Services, Department of Public Health, *Guidelines for Safe Handling of Owl Pellets*, www.mass.gov/eohhs/docs/dph/cdc/owl-pellet-handling-guidelines.pdf
- Massachusetts Executive Office of Energy and Environmental Affairs, *Massachusetts Prohibited Plant List*, www.mass.gov/eea/agencies/agr/farm-products/plants/massachusetts-prohibited-plant-list.html
 - *Elodea densa* is a restricted plant. For a permit to have the plant in your classroom, you must complete and submit the permit request form. Contact Trevor Battle (trevor.battle@state.ma.us) for this form.
 - Note also that *Elodea canadensis* is a similar species that is not on the prohibited plant list and is available for sale from biological supply catalogs.

[‡] Maryland Department of Education. (1999). Biology and environmental science: Recognizing and controlling hazards. In *Science safety manual*. Retrieved from mdk12.msde.maryland.gov/instruction/curriculum/science/safety/hazards.html

- Massachusetts Introduced Pest Outreach Project, massnrc.org/pests/factsheets.htm
 - U.S. Department of Agriculture, Animal and Plant Health Inspection Service, letter to teachers and educators about giant African land snails, massnrc.org/pests/linkedddocuments/snail.doc
- Massachusetts Division of Marine Fisheries, *Special License Application* (see the “Scientific Collectors License” section), www.mass.gov/eea/docs/dfg/dmf/commercialfishing/specialapp.pdf

4. Bird Carcasses

Teachers should not take bird carcasses found in the environment and use them for lab work. This practice spreads bird-borne diseases. For more information, check the following websites:

- Massachusetts Department of Public Health, *Frequently Asked Questions about Avian Flu*, www.mass.gov/eohhs/docs/dph/cdc/flu/avian-faq.pdf
- CDC, *Birds Kept as Pets*, www.cdc.gov/healthypets/pets/birds.html

5. Safety Contract Examples

- Flinn Scientific’s *Student Safety Contract*, www.flinnsci.com/Documents/miscPDFs/Safety_Contract.pdf
- American Chemical Society, *Student Laboratory Code of Conduct for Secondary Science Program*, www.acs.org/content/acs/en/about/governance/committees/chemicalsafety/chemical-safety-in-the-classroom.html

6. Safe Handling of Chemicals

- Massachusetts Department of Environmental Protection, *Massachusetts School Chemical Management Program*, www.mass.gov/eea/docs/dep/service/schlchem.pdf
- U.S. Consumer Safety Product Commission and National Institute for Occupational Safety and Health, *School Chemistry Laboratory Safety Guide*, www.cdc.gov/niosh/docs/2007-107/pdfs/2007-107.pdf
- American Chemical Society, *Chemical Safety in the Classroom*, www.acs.org/content/acs/en/about/governance/committees/chemicalsafety/chemical-safety-in-the-classroom.html
- Massachusetts Department of Environmental Protection, *Mercury*, www.mass.gov/eea/agencies/massdep/toxics/sources/mercury.html

1. Allergies

Teachers should be aware that students may be allergic to latex, a material commonly found in balloons and laboratory gloves. For information on latex allergies, check the following resources:

- *American Family Physician* article on latex allergy, www.aafp.org/afp/980101ap/reddy.html
- UK Health and Safety Executive site, www.hse.gov.uk/
- American Latex Allergy Association article, latexallergyresources.org/articles/js-online-article-balloons-busted

- Balloon Council site, www.balloonhq.com/BalloonCouncil/facts.html

2. Choking Hazards

Some materials commonly used in science labs and lessons (for example, latex balloons) may pose choking hazards for small children. Teachers should be aware of the risks posed by these materials and take necessary precautions to prevent choking. See HealthyChildren.org for more information: www.healthychildren.org/English/health-issues/injuries-emergencies/Pages/Choking-Prevention.aspx

3. Electricity

When electricity is used in experiments, students must be warned of risk of shock, even when voltage is low.

Electrostatic generators. The Maryland Department of Education's *Science Safety Manual*[§] states that:

Electrostatic generators used in demonstrations of static electricity produce high voltages (about 10^5 volts) with very low currents. The danger of these generators depends on their size and capacity to produce enough current to be dangerous. In many cases the shock from such devices is very quick and not harmful. The startling effect, however, can be detrimental to persons with heart conditions.

In general, experiments that use human subjects to demonstrate the effect of electrical shock should not be attempted due to the large variation in physical and physiological factors. Leyden jars—which can be charged with electrostatic generators—are especially dangerous because of their capacity to store a charge for long periods of time. An accidental discharge through a person can be avoided by properly shorting the devices after use.

The following resources provide additional information:

- Nuffield Foundation, *Van de Graaff Generator Safety*, www.nuffieldfoundation.org/practical-physics/van-de-graaff-generator-safety
- Science Hobbyist, *(VandeGraaff) Electrostatic Machine Safety*, amasci.com/emotor/safe.html
- Science Hobbyist, *Electrostatic and VandeGraaff Generators: Solving Humidity Problems*, amasci.com/emotor/humid.html

Sample Safety Guidelines

Science staff should actively work to set safety policies, expectations, and classroom practices for their school and district. Example safety guidelines for the science classroom are included on the following pages. This example is excerpted from the Council of State Science Supervisors' *Science and Safety: It's Elementary*, found at www.csss-science.org/safety.shtml. This is not necessarily a definitive list, nor does it constitute a definitive safety policy. It is included as an example for discussion and illustration.

[§] Maryland Department of Education. (1999). Physics: Balancing creativity and safety. In *Science safety manual*. Retrieved from <http://mdk12.msde.maryland.gov/instruction/curriculum/science/safety/physics.html>

1. Where can I find a general science safety checklist?

General Items

The following practices should be observed in your science instructional environment.

1. **Have and enforce** a safety contract signed by students and parents.
2. **Identify** medical and allergy problems for each student to foresee potential hazards.
3. **Assess and minimize** barriers for students with disabilities.
4. **Model, post, and enforce** all safety procedures. Display safety posters and the numbers for local poison control centers and emergency agencies.
5. **Know** district and state policies concerning administering first aid and have an adequately stocked first-aid kit accessible at all times.
6. **Report** all injuries, including animal scratches, bites, and allergic reactions, immediately to appropriate personnel.
7. **Be familiar with** your school's fire regulations, evacuation plans, and the location and use of fire fighting equipment.
8. **Post and discuss** emergency escape and notification plans/emergency phone numbers in each space used for science activity.
9. **Make certain** that the following items are easily accessible in elementary classrooms, classrooms with labs, and science resource rooms:
 - appropriate-size chemical splash goggles that are American National Standards Institute (ANSI) Z87 or Z87.1 coded and of type G, H, or K only
 - non-allergenic gloves
 - non-absorbent, chemical-resistant protective aprons
 - eyewash units
 - safety spray hoses/shower
 - ABC tri-class fire extinguisher(s)
 - flame retardant treated fire blanket
10. **Make certain** that you, your students, and all visitors are adequately protected when investigations involving glass (not recommended), heat, chemicals, projectiles, or dust-raising materials are conducted.

11. **Implement** a goggle sanitation plan for goggles used by multiple classes.
12. **Keep** spaces where science activities are conducted uncluttered.
13. **Limit** size of student working groups to a number that can safely perform the activity without causing confusion and accidents.
14. **Prepare** records [including Material Safety Data Sheets (MSDS)] (See question 5) on all chemicals used] on safety training and laboratory incidents.
15. **Provide** adequate workspace (45 square feet) per student as well as low table sections for wheelchair accessibility that can be supervised by recommended ratio of teacher to student of 1:24.
16. **Do not permit** eating and drinking in any space where science investigations are conducted.
17. **Do not store**, under any circumstances, chemicals and biological specimens in the same refrigerator used for food and beverages.
18. **Do not use** mercury thermometers with elementary students, since their use is inappropriate. Any mercury thermometers still present should be disposed of properly.

Glassware Precautions

19. **Substitute** plasticware for glassware in elementary classrooms, classrooms with labs, and science resource rooms.
20. **Possess** a whiskbroom, dust pan, and disposal container for broken glass when using glassware of any type (not recommended).
21. **Make certain** that students understand they are not to drink from glass/plasticware used for science experiments.

Chemical Precautions

22. **Label** equipment and chemicals adequately with respect to hazards and other needed information.
23. **Store** chemicals in appropriate places: e.g., in secured cabinet or stockroom, at or below eye level, on wooden shelves with a front lip, and without metal supports. Storage space should be kept cool, dry, and locked.



24. **Make certain** that students understand that chemicals must never be mixed "just for fun" or "to see what might happen"; that they should never taste chemicals; and that they should always wash their hands after working with chemicals.

Electrical Precautions

25. **Make certain** that students understand that they must NOT perform experiments with electrical current at home or at school "just for fun or to see what will happen." Only supervised activities directed by the teacher should be done.
26. **Make certain** electrical cords are short and plugged into the nearest socket. Emphasize that students grasp the plug, rather than the cord, when unplugging electrical equipment. Cords also must be in good repair. Do not use extensions.
27. **Be sure** that students' hands and surrounding surfaces are dry before plugging in electrical cords or turning on and off switches and appliances/tools. Water can be a good conductor of electricity.
28. **Make sure** all electrical outlets are Ground-Fault Interrupters (GFIs). Cover outlets when not in use.
29. **Use** only three-prong (grounded) plugs when small electrical tools such as heating elements for terraria and aquaria, hot plates, or small motors are used. Extension cords **should not be used**.
30. **Instruct** students never to grasp any electrical device that has just been turned off, since it may be hot after use and result in serious burns.
31. **Make certain** that students understand that connecting only a wire between the terminals of a battery will result in the wire getting hot and possibly causing serious burns.
32. **Remind** students that even non-electrical hand tools such as hammers, screwdrivers, or hand drills slip easily and can produce projectiles or inflict serious cuts. Appropriate safety equipment **should always be worn**.

2. Where can I find a checklist of common laboratory operating procedures?

Regulated Safety Rules

- Know district, local, and state statutes and regulations regarding animal care, storage of chemicals, and fire safety. Does your district have a written Chemical Hygiene Plan? A district Science Safety Policy?
- Maintain Material Safety Data Sheets (MSDS) for all chemical supplies with a second set in the main office; generic chemicals and/or store-bought substances should also be listed in the inventory.
- Require the use of American National Standards Institute (ANSI) Z87.1 approved eye protective equipment (typically chemical splash safety goggles – types G, H, or K only), gloves, and aprons during all activities, including demonstrations in which chemicals, glassware, potential projectiles, or heat are used.
- Dispose of unwanted chemicals and materials according to state and local regulations.

General Safety Rules

- Know the safety hazards before starting an activity; you should do a “dry run” without the students to identify unforeseen hazards.
- Use only equipment that is in good working order; inspect equipment before each use.
- Maintain and have immediate access to a first-aid kit for emergency treatment (if local and state policies allow), as well as biohazard and chemical spill kits/materials.
- Never use unfamiliar chemicals unless MSDS sheets are consulted first. Consult MSDS and the container label before using chemicals for the first time.
- Never use mercury thermometers in elementary classrooms/labs.
- Prevent contamination by not returning unused chemicals to the original container.
- Label and date all storage containers of laboratory chemicals and preserved specimens upon receipt. Properly label all secondary chemical and specimen (set-out) containers.
- Use unbreakable plastic equipment whenever possible; maintain a separate waste container for broken glass; sweep up broken glass with dustpan and brush.
- Check with school medical personnel at the beginning of the school year to identify student medical conditions such as allergies, epilepsy, etc.

and be prepared to take appropriate actions.

- Check safety manuals for chemical and plant toxicity before use.

- Tie back long hair; secure loose clothing and dangling jewelry; do not permit open-toed shoes or sandals during lab activity. Clothing should cover upper and lower body.
- Wear appropriate protective eyewear for chemical and projectile hazards, as well as appropriate lab aprons and gloves.
- Never permit eating and drinking in the science classroom/laboratory.
- Advise students not to engage in a laboratory activity unless directed by you, and only after safety procedures are discussed and student “plans of action” (in inquiry) are reviewed and approved.
- Have students wash hands and clean nails directly after coming into contact with animals, plants, soil and water samples, chemical substances, and laboratory/work surfaces. Hands should always be washed upon completion of an inquiry activity.
- Teach students to pick up and transport a microscope with one hand under the base and one hand on the arm.

Classroom Management

- Supervise students at all times. Do not permit students to conduct unauthorized experiments or work unsupervised. Do not make assignments that require students to perform hazardous experiments at home.
- Maintain a clear view of all students at all times. Set up science learning centers for single students or small groups that allow easy observation of students. Periodically update and evaluate safety concerns in the centers.
- Do not block access to exits, emergency equipment, and utilities with personal items.
- Have students participate in determining classroom rules, laboratory safety procedures, and emergency action plans.
- Enforce established rules and procedures immediately and appropriately.
- Practice the procedures and rules yourself before expecting students to follow them, so you can identify unforeseen consequences and avoid liability.
- Discuss safety concerns with students prior to each laboratory activity and monitor students for compliance.



- Ensure that sight-impaired students are made familiar with and always use the same area and equipment. These students should be “huddled” with a student who can read instructions (if Braille forms or a tape recorder are not available) and guide him/her to safety in case of emergency.
- Model safety procedures prior to an activity and have students practice the procedures before beginning work.
- Use student safety contracts; have students and parents read and sign.
- Have an established procedure for student accident or injury; e.g., student runner, telephone/intercom, accident/injury report to the principal, etc.
- Lock science classrooms, cabinets, prep area doors, etc., when not in use; do not permit students in chemical/equipment storage rooms.
- Turn off gas and electrical equipment and close open containers during a fire drill. Gas, if available in the classroom, should always be turned off at the master valve when not in use.
- Have students report all accidents to the classroom teacher.
- Have students check the classroom daily for safety hazards.
- Use only age-appropriate activities with students.
- Have a designated “broken glass” container, if you use equipment made of glass (NOT recommended).
- Limit the size of student working groups to a number that can safely perform the activity without causing confusion and accidents.
- Display commercial and/or student-made safety posters and classroom safety rules in the classroom.
- Do not permit elementary students to dispense chemicals or handle containers of hot liquids.
- Discourage tasting and smelling. When smelling is required, students should waft vapors toward their nose using their hand. They should never inhale the vapors directly.
- Dispose of all waste chemicals properly. There should be separate containers for each solid. Non-hazardous liquids/solutions should be rinsed down the drain one at a time and flushed with plenty of water.
- Clean up spills or ice immediately on tables and floor; take appropriate precautions against contamination as needed.
- Have students clean up their work areas at the completion of each day’s activity, including sinks and floor.