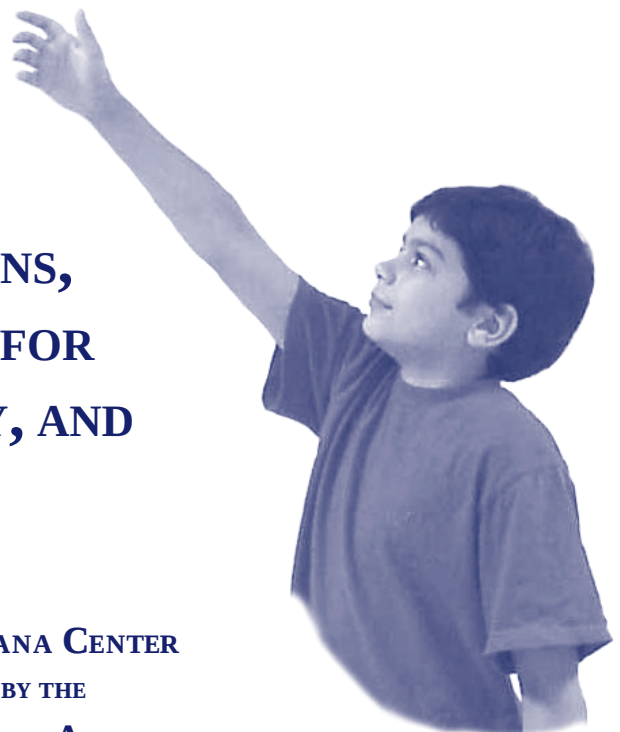


TEXAS SAFETY STANDARDS

Kindergarten
through
Grade 12

**A GUIDE TO
LAWS, RULES, REGULATIONS,
AND SAFETY PROCEDURES FOR
CLASSROOM, LABORATORY, AND
FIELD INVESTIGATIONS**

CHARLES A. DANA CENTER
FUNDED BY THE
TEXAS EDUCATION AGENCY



TEXAS SAFETY STANDARDS

KINDERGARTEN

THROUGH

GRADE 12



**A Guide to Laws, Rules,
Regulations and
Safety Procedures
for Classroom,
Laboratory, and Field
Investigations**

**Second Edition
2000**

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INQUIRY OPENS THEIR MIND...



...GUIDE THEIR JOURNEY SAFELY

Dedicated to the children of the Charles A. Dana Center...

Rachael Bushn
Erin Cole
Kim Collins
Traci Collins
Christine Evans
Ruby Youker Shell
Julie Tran
Cara Westbrook
Erica Westbrook
Adan Yanez

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Jim Nelson
Commissioner of Education

January 7, 2000

To the Administrator and Science Teacher Addressed:

Citizens of our state are dependent upon science as never before. Our economy is in the midst of a transformation in which peoples' livelihoods depend less upon what they can produce through their labor and more on what they can produce through their ideas. Science leads the way in this conceptual-based economy. Scientific literacy is an essential tool for every Texas citizen.

The Texas Essential Knowledge and Skills require students to understand and do science. Students must not only learn content, they must understand the processes associated with science, including observation, model building, and inquiry. These science skills can best be understood through active learning practiced in the science classroom as well as in field and laboratory experiences. As we encourage students to collect data and carry out investigations, we must be aware of their safety.

The purpose of this document is to provide guidelines for developing a safety program both at the campus and district level. A commitment to safety demands a team effort with everyone, from administrators to support staff, teachers, parents, and students alike, sharing the responsibility for safety.

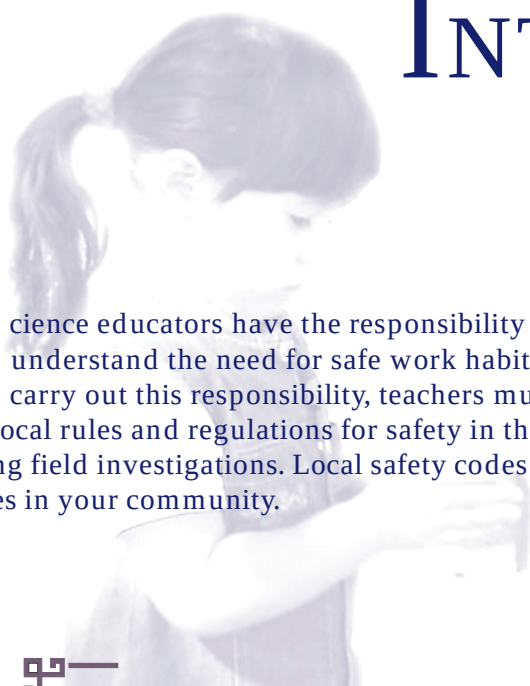
As we move forward into the millennium, we must help our students learn and use science in a safe environment.

Sincerely yours,

Jim Nelson
Commissioner of Education

Celebrating 50 Years of Service to Public Education

INTRODUCTION



Science educators have the responsibility to teach by example and to help students understand the need for safe work habits and interactions with the environment. To carry out this responsibility, teachers must have a working knowledge of federal, state, and local rules and regulations for safety in the science classroom and laboratory, as well as during field investigations. Local safety codes can be acquired from the city government offices in your community.

“Teachers of science must know and apply the necessary safety regulations in the storage, use, and care of the materials used by students. They adhere to safety rules and guidelines that are established by national organizations such as the American Chemical Society and the Occupational Safety and Health Administration, as well as by local and state regulatory agencies. They work with the school and district to ensure implementation and use of safety guidelines for which they are responsible, such as the presence of safety equipment and an appropriate class size. Teachers also teach students how to engage safely in investigations inside and outside the classroom.”

National Research Council, Position Statement, 1996

CONDITIONS AFFECTING SAFE SCIENCE CLASSROOMS

OVERCROWDING AND SAFETY

Overcrowding in science classrooms and laboratories, where equipment and chemicals are used, should be a safety concern for every teacher and administrator. Otherwise, overcrowded conditions could result in liability problems for the school district.

Overcrowding that results in injury has led to charges of negligence in some states. For example, the school’s principal and a teacher were accused of negligence in the 1981 case, *Bush v. Oscoda Area Schools*.

National Science Teachers Association’s recommendation for maximum class size

Elementary School.....	22 per class
Middle School.....	24 per class
High School.....	24 per class

The following excerpt from *Bush v. Oscoda* illustrates the legal and safety problems that can result from overcrowded science classrooms.

A 14 year-old girl was severely burned when the plastic jug of alcohol she was carrying exploded. The jug was used to transport alcohol to fill portable alcohol burners in a science class. Because of overcrowded conditions, the science class was being taught in a non-science classroom. The parents sued the school district resulting in a verdict against the principal of the school and the science teacher. The principal was found negligent for scheduling a science class in a room that was not properly equipped for science instruction. The teacher was found negligent for conducting the class in unsafe and inadequate conditions.

Bush v. Oscoda Area Schools, 1981

The correlation between the frequency of accidents and the number of students in a laboratory at one time is supported by data. According to Macomber, 1961, these data show that accidents become more frequent and more serious as the class size increases. Similar results were documented by Ward and West in a study conducted in Texas schools.

Distribution of Laboratory Accidents by Seriousness and Class Size

Class Size	Number of Instructors	% of Total Instructors	Minor Accidents	Moderate Accidents	Serious Accidents
Under 10	1	0.7	100	0.0	0.0
11–20	5	6.4	77.8	22.2	0.0
21–30	95	67.9	60.0	37.9	2.1
Over 30	35	25.0	42.9	40.0	17.1

Ward and West (1990), and West (1991)

Researchers have found that in a standard science laboratory where students regularly conduct investigations, more accidents occur when students have less than 41 square feet of working space and when there are more than 22 students in one class (Ward and West, 1990).

“The number of students assigned to each laboratory class should not exceed 24. Students must have immediate access to the teacher in order to provide a safe and effective learning environment.”

Council of State Science Supervisors: *Laboratory Safety*, 1991

OVERCROWDING AND STUDENT ACHIEVEMENT

There is strong evidence that correlates overcrowded public schools to decreased student achievement. Students can gain a deeper understanding of science concepts when they are able to apply science processes in a laboratory setting. However, the laboratory must be safe, and students must have adequate space to conduct science investigations and activities.

Overcrowding may force a teacher to reduce or eliminate the amount of time allowed for students to do hands-on science. In addition, it becomes more difficult for teachers to maintain discipline when they must supervise larger numbers of students.

The National Science Teachers Association recommends the following amount of space for specialized classroom /laboratory combinations and for a standard science laboratory.

Classroom Type	Elementary School	Middle School	High School
Classroom /laboratory	45 square feet / student	50 square feet / student	60 square feet / student
Science laboratory	40 square feet / student	45 square feet / student	50 square feet / student

Adequate space is required for safe and effective science instruction. The Texas Administrative Code, §61.103. *School Facilities Standards*, defines the number of pupils in a classroom as 22 for elementary school and 25 for middle and high schools.

General classrooms are required to have a minimum of:

- 36 square feet per pupil or 800 square feet available per classroom for Prekindergarten–Grade 1
- 30 square feet per pupil or 700 square feet available per classroom for Grades 2–5
- 28 square feet per pupil or 700 square feet available per classroom for Grades 6-12

Specialized science lecture /laboratory room shall have a minimum of:

- 41 square feet per pupil or 900 square feet per lecture /laboratory room at the elementary school level
- 50 square feet per pupil or 1000 square feet per lecture /laboratory room at the middle school level
- 50 square feet per pupil or 1200 square feet per lecture /laboratory at the high school level

Safety Is Everyone's Responsibility

SCIENCE STUDENTS

Science students should not expect the teacher to “shoulder the entire responsibility” for a safe learning environment in the science classroom and laboratory. Each student can contribute to the safety of others and help maintain an atmosphere of safe learning by accepting a few basic responsibilities.

STUDENT RESPONSIBILITIES

1. Read and study the science activity or laboratory investigation before coming to class.
 - ☞ Ask questions about the activity before beginning the exercise.
 - ☞ Identify and understand the hazards and necessary precautions you need to take.
 - ☞ Understand the concept of the investigation, and know how to proceed with the investigation.
2. Know and follow all safety rules prior to the first investigation.
 - ☞ Read, understand, and sign the safety contract (see Appendix D).
 - ☞ Wear the appropriate protective equipment, such as goggles and laboratory aprons.
 - ☞ Tie back long hair to keep it away from chemicals, open flames, and equipment.
 - ☞ Tie back or remove articles of clothing or jewelry that could touch chemicals or flames during investigations.
 - ☞ Wear shoes that enclose the feet—no sandals or open-toe shoes.
 - ☞ Never eat or drink anything while in the laboratory.
 - ☞ Locate the safety equipment, such as the eyewash station, and know how to use it correctly.
 - ☞ Know where the exits are located and the proper procedures to be followed in an emergency.
3. Be alert in the laboratory. Watch for potential problems, and report unsafe situations immediately. Do not work alone in the laboratory.
4. Do not attempt unauthorized activities. Work only on authorized activities that are related to the investigation.
5. If a chemical spill occurs, report it immediately and follow the teacher's instructions.
 - ☞ Move quickly from the site.
 - ☞ Wash off chemicals that have splashed onto the skin or clothing for 15 minutes using large amounts of water in the safety shower or eye / face wash station.
6. Keep your area clean. Clean up the area at the end of the class. Dispose of biological and chemical waste properly.
7. Do not enter preparatory or equipment storage rooms or chemical storerooms.
8. Always wash your hands for at least 20 seconds with soap and warm water before leaving the laboratory.

SCIENCE TEACHERS

Classrooms and science laboratories may be crowded, increasing the probability of accidents occurring. Advance planning and preparation is one of the best safety practices a teacher can use to reduce the probability of accidents.

TEACHER RESPONSIBILITIES

1. Understand each science laboratory or field investigation in advance.
 - ☼ Carefully read and scrutinize all investigations and activities for safety procedures and materials the students will be handling.
 - ☼ Read and understand the information on Materials Safety Data Sheets (MSDS) related to chemicals or other hazardous materials that will be used in the laboratory.
 - ☼ Seriously consider all the hazards discussed in the MSDS and determine if the chemicals are safe for students to use. Consider substitute chemicals or procedures.
 - ☼ Do a trial laboratory experience if you have not done the investigation before.
 - ☼ Remember, teachers and students are to wear protective eyewear and clothing when appropriate.
 - ☼ Anticipate what could go wrong during a typical laboratory experience, and take measures to reduce the probability of an accident occurring.
2. Have regular pre-laboratory activities before taking students into a laboratory setting.
3. Label all chemicals correctly and clearly (see Chapter VI).
4. The materials to be used during the laboratory investigation should be arranged carefully and placed in a safe area for students to use.
5. Maintain order and discipline during the activity. Safety rules are to be obeyed by all students.
6. Monitor the laboratory room or field site. Work with students to correct any procedure or behavior that is not safe.
7. Students should promptly clean up their areas while wearing safety goggles. Chemicals and biological wastes should be disposed of correctly.
8. If accidents do occur, follow the school district's policy and guidelines on administering first aid and reporting the accident. Do not wait to write a report of what caused the accident, injuries, action taken, and results. A more accurate description can be made soon after an accident occurs.

SCIENCE CHAIRS AND LEAD TEACHERS

The science chair and lead teacher must make safety a high priority. They should monitor safety in the laboratory, preparatory room, and storage room.

CHAIR AND LEAD TEACHER RESPONSIBILITIES

1. Develop a monthly schedule for inspecting laboratory facilities, preparatory and equipment rooms, and storage rooms. Identify problem areas, and develop plans to improve safety.
2. Discuss with the science teachers the school district's procedures for proper disposal, labeling, and handling of chemicals.

3. Announce additions to the MSDS library as new chemicals and hazardous materials are added to the department. Each teacher should be made aware of the hazards of new chemicals.
4. Work with teachers to keep students in compliance with the safety rules. The chairperson and lead teacher should set and model high standards of safety.
5. Assist with emergency actions that are needed for laboratory accidents, assistance to the injured person, and the cleaning up of chemical spills, broken glassware, and fires. Planning and advance preparation will help everyone to stay calm and think clearly if an accident does happen.
6. Work with science teachers to report and investigate accidents. The purpose of the investigation is to determine the cause and make corrections, if possible; not to place blame.
7. It should be the responsibility of the science chair to maintain a file and record of documented accidents.

SCIENCE SUPERVISORS

The science supervisor has considerable responsibility in directing the science curriculum of the school district. The science supervisor should work closely with chairpersons and lead teachers on the science safety program and serve as a liaison between central administrators and school campuses. Most of the responsibilities related to safety are those of the science supervisor. The science supervisor should conduct annual safety professional development and provide safety updates to the science teachers regularly.

SUPERVISOR RESPONSIBILITIES

1. Assist the science chair and lead teacher on each campus with meeting the requirements of the Hazard Communications Act.
2. Monitor all laboratory facilities for required safety equipment. The safety equipment needs to be installed correctly and function properly. An annual check of each campus, including chemical storerooms and preparatory and equipment rooms, should be part of the routine tasks (see Appendix E).
3. Work with the campus science chair and lead teacher to review science laboratory and field investigations for safe practices and safe use of materials. Consider alternate investigations in cases where existing conditions might compromise safety.
4. Require an annual chemical inventory on each campus. Materials Safety Data Sheets must be kept on all chemicals in the school's science work area.
5. Discuss with teachers the school district's process and procedure for properly disposing of chemicals and biological waste. Teachers should be made aware of their obligation to follow designated procedures for chemical waste disposal.
6. Be well informed of the laws, rules, and regulations concerning safety, and conduct professional development on safety.
7. Become active in state and national science organizations for access to current safety information.

ADMINISTRATORS

A school district's administrators, whether on the campus or in the district's central offices, have a crucial role in assuring that students and teachers work and learn in an environment that is safe.

ADMINISTRATOR RESPONSIBILITIES

Develop a district safety policy, and provide a safety program that includes

1. implementing the school district's safety program;
2. supporting professional development on safety;
3. developing emergency procedures;
4. ensuring that science classes do not have more than 24 students and do not exceed the number of work stations in a laboratory room;
5. providing laboratory facilities with two exits, proper lighting and ventilation, master utility cutoff valves, and safe, sufficient, properly located electrical outlets;
6. providing necessary safety equipment, such as eye/face wash stations, fume hoods, safety showers, fire extinguishers, safety eyewear, fire blankets, chemical spill kits, etc.;
7. conducting annual inspections and a maintenance program to ensure safe working conditions;
8. producing safety policies that can be adopted by the local school board and implemented on all campuses;
9. maintaining compliance with the Hazard Communications Act; and
10. providing the district's procedures for proper disposal of chemicals and biological wastes.

Texas Education Agency, Science Laboratory Safety and Chemical Waste Disposal for Texas Teachers, 1990