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ABSTRACT

This paper reports on a survey to discover the types of laboratory accidents that occur in Texas public schools, the factors associated with such accidents, and the practices of schools with regard to current laboratory safety requirements. The purpose of the survey is to better understand safety conditions in Texas public schools and to help educators maintain safer conditions for both teachers and students in science classrooms across Texas. Survey findings suggest a relationship between student-teacher ratios and the occurrence of both minor and major accidents. (KHR)

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ED 474 503

An Analysis of Laboratory Safety in Texas

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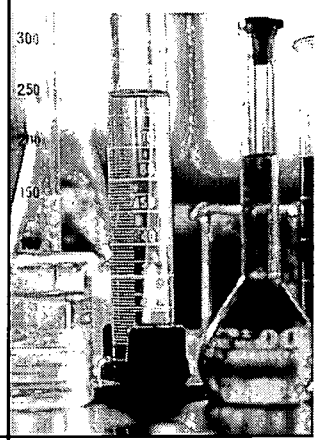

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Introduction

Federal, state, and local safety standards can have an immeasurable impact on the lives of the students, teachers, and communities involved with science education. Student accounts of accidents in science classrooms help illustrate the importance of enforcing safety standards:

> *Due to lack of funding, high school class sizes are large. Extra desks and chairs are packed into the science classroom, and it is difficult to move from the classroom area to the lab area. During a fire drill, everyone rushed to get out of the classroom, pushing chairs and desks into one another. Some students fell.*
>
> *We were doing an experiment and there was some methyl alcohol on the table that got underneath one of the petri dishes. The alcohol ignited and forced the dish up into the air. . . . [It] shattered the dish and sent pieces of glass flying all the way to the back of the room.*
>
> *During our labs, we sometimes wore goggles, sometimes not, sometimes gloves, sometimes not. Safety wasn't a big deal. Once, we were working with sulfuric acid and not everyone had on goggles. In handling the chemical, some got into some people's eyes and burned them.* [1]

These examples are not meant as dramatic extremes but represent the reality of what is possible in every science classroom and laboratory when safety standards are not followed.

Science learning experiences allow students to explore and observe phenomena both in the laboratory and in the natural world. They require a wide range of materials and instruments to facilitate this instruction. Safety is an essential part of the process, whether the learning experiences occur in the classroom, in the field, or in the laboratory.

Purpose of This Report

Texas state law requires public school teachers and administrators to provide a safe learning environment where students are protected from physical and mental harm. [2] To ensure the safety of students in school science laboratories, Texas provides a number of safety standards laws and regulations.

Laws and Regulations Concerning Laboratory Safety

1. Protective Eye Devices in Public Schools (3)
2. Standards for Face and Eye Protection in Public Schools (4)
3. Curriculum Requirements—40% Laboratory and Field Investigations (5)
4. School Facilities Standards (6)
5. Hazardous Substances (7)
6. Hazard Communications Act (8)
7. Life Safety Code (9)
8. Local fire and safety codes

For an explanation of these and other laws, rules, and regulations, refer to the Texas Education Agency's publication Texas Safety Standards: Kindergarten through Grade 12, *available through the Texas Education Agency or on the Science TEKS Toolkit website. (10)*

While all Texas public schools are to follow these laws and regulations, there is no structure in place to ensure that schools actually meet current requirements. Identifying a possible gap between policy and policy compliance, the Charles A. Dana Center at The University of Texas at Austin administered a modified laboratory safety survey developed by Susan Ward and Sandra West. [11]

The survey was created in order to discover the types of laboratory accidents in Texas public schools, the factors associated with such accidents, and the practices of schools with respect to current laboratory safety requirements. Both the survey and this report can serve as tools to better understand safety conditions in Texas public schools and, ultimately, to help educators maintain safer conditions for both teachers and students in science classrooms across Texas.

Methodology

The survey included questions about the types and severity of accidents in school science laboratories, the types of safety equipment used, safety procedures followed, compliance with safety recommendations that are not required by law, and teacher and student laboratory training. In addition, respondents answered a number of background questions, such as:

- What is the student population of your school?
- Would you describe your community as urban, suburban, or rural?
- How many science classes do you teach?
- How many teaching preparations do you have?
- How many classes do you teach of Integrated Physics and Chemistry, Biology, Chemistry, Physics, and other science courses?
- What is the average class size (student-teacher ratio) for your assignment?
- Do you conduct science investigations in a classroom, laboratory, or a combined classroom/laboratory?
- What is the approximate square footage of the room where you conduct science investigations?

Surveys were distributed at the October 2000 Conference for the Advancement of Science Teaching (CAST), an annual statewide convention of 3,500 K–18 science educators. Dana Center personnel operating a science booth made surveys available by offering a copy of *Texas Safety Standards: Kindergarten through Grade 12* as an incentive for attendees to complete the survey. The conference generated approximately 475 surveys. Surveys were also distributed at 12 laboratory safety professional development sessions across the state. Participants voluntarily completed the surveys after the training. One hundred fifteen surveys were collected at the professional development sessions, for a total of 590 responses. In each setting, all of the respondents volunteered to complete the survey, and the names of all respondents and their associated schools and districts remained confidential.

As shown in Table 1, the majority of respondents (57 percent) taught in schools with fewer than 1,000 students. This distribution is similar to the distribution of all secondary science teachers from across the state. About equal percentages (~33 percent) of the respondents taught in urban, suburban, and rural schools. This distribution is somewhat dissimilar to the distribution of science teachers across the state. Across Texas, roughly 25 percent of science teachers are in urban schools, 30 percent are in suburban schools, and 45 percent are in rural schools.

Table 1: Distribution of respondents by school enrollment and community type

	school size			community type		
	<1000	1000-1500	>1500	Urban	Suburban	Rural
% of respondents	57%	20%	24%	31%	33%	36%

Table 2 shows the types of science courses taught by the respondents. Forty-four percent of respondents reported that they taught a class other than Integrated Physics and Chemistry, Biology, Chemistry, or Physics. The respondents reporting "Other" could have taught at least one of the following science classes: [12]

- Elementary School Science
- Middle School Science
- Environmental Systems
- Aquatic Science
- Astronomy
- Anatomy and Physiology of Human Systems, or
- Geology, Meteorology, and Oceanography

Table 2: Distribution of respondents by type of science course taught *

	Integrated Physics and Chemistry	Biology	Chemistry	Physics	Other Science
% of respondents	25%	25%	20%	11%	44%

*some respondents may teach more than one type of course

The survey did not ask respondents to designate their assigned grade level, thus the distribution of respondents with respect to school level (elementary, middle school, or high school) is unknown.

The sample of science teachers responding to the survey appeared similar to the distribution of science subject-matter teachers across the state. However, given that respondents chose to attend the conference and that both the conference and professional development attendees volunteered information, the respondents were not likely to be representative of average science teachers. Those attending the conference may be more likely to seek innovative instructional methods and current information about science than other science teachers. Attendees could have also come from schools and districts that tend to support the professional development of teachers.

Results and Analyses

Analysis of the survey results is intended to describe the occurrence of laboratory accidents in Texas public schools and the factors associated with such accidents, and to document the practices of schools with respect to current requirements of laboratory safety.

Laboratory Accidents

Respondents answered the following survey questions about laboratory accidents:

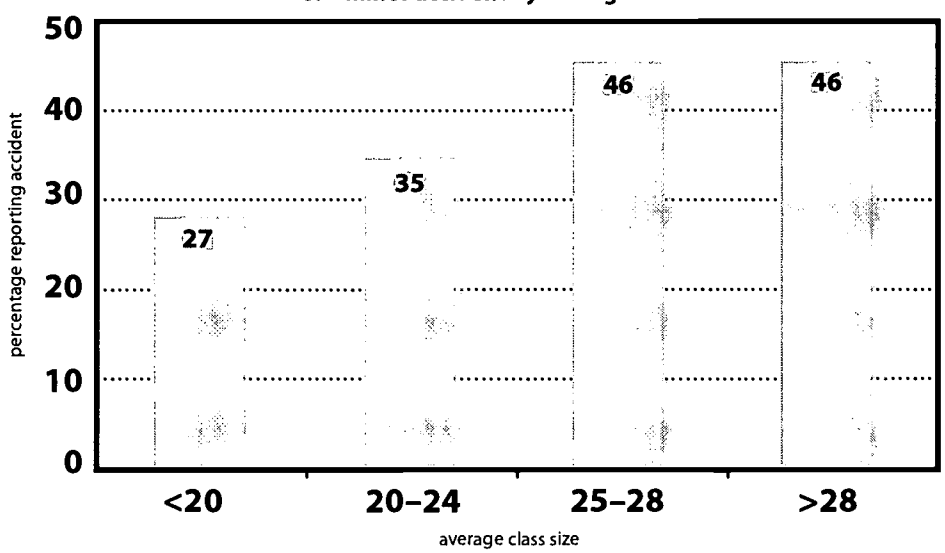
- Have any minor accidents (those not requiring medical attention) occurred in any laboratories at your school during this year? If so, how many?
- Have any accidents requiring medical attention occurred in any laboratory at your school during the past five years? If so, how many?
- If an accident occurred, describe the type of accident: explosion, chemical burns, broken glass, faulty equipment causing injury, heat burns, electrical shock, foreign material in the eyes, and ingestion of foreign material.

Minor Accidents

Thirty-six percent of respondents reported a total of 460 minor laboratory accidents in their schools during the 2000–2001 year. Considering that less than one-half of the school year had passed when the survey was administered, the percentage of teachers reporting a minor accident was quite high. Of those reporting a minor accident, 79 percent reported the occurrence of less than five accidents, while another 14 percent reported the occurrence of five to nine accidents. Approximately seven percent of the teachers reported ten or more minor accidents.

Research has indicated that as the number of students in science classes increases, the likelihood of accidents occurring also increases. [13] Because of the small number of teachers in this survey reporting a class size of greater than 32, responses indicating a class size of 29–31 and greater than 32 were collapsed into one group of teachers with a class size of greater than 28. As shown in Graph 1, the survey responses indicate that the likelihood of accidents occurring increased as

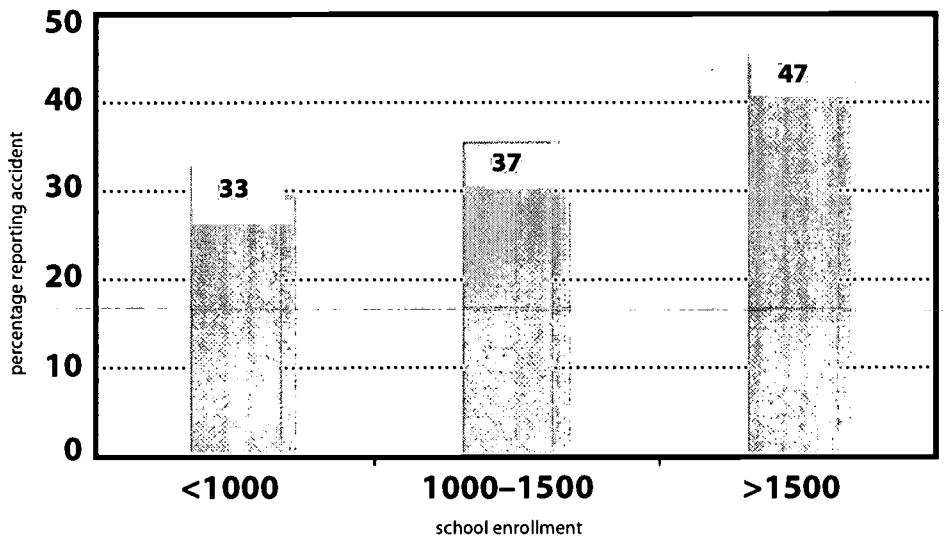
Graph 1: Percentage of respondents reporting the occurrence of a minor accident by average class size



the class size increased. However, the percentage of teachers reporting accidents did not appear to increase once the class size exceeded 25. This relationship suggests that the number of laboratory accidents may be reduced by decreasing science classes to 25 students or less.

Schools with the largest enrollments (more than 1,500 students) had greater percentages of teachers reporting minor laboratory accidents than schools with the smallest enrollments (less than 1,000 students). Graph 2 displays these results.

Graph 2: Percentage of respondents reporting the occurrence of a minor accident by school enrollment



Because more accidents occurred both when the average class size increased and when the average school enrollment increased, it was not immediately clear whether an increase in the number of minor accidents reported was associated with larger school enrollments or with larger class sizes. The data suggested that school enrollment affected the occurrence of minor accidents apart from the effect of class size. For example, of teachers reporting the same student-teacher ratio (e.g., 20–24 students to one teacher), those in schools with larger enrollments were still more likely to report the occurrence of minor accidents than teachers in schools with smaller enrollments. The available data did not allow for an explanation as to why schools with larger numbers of students have higher accident rates. This area deserves further investigation.

Major Accidents

Overall, 13 percent of the respondents reported a total of 85 major accidents requiring medical attention over the last five years. Of those noting a major accident, nearly 75 percent stated that only one major accident occurred, while the remaining 25 percent reported that between two and five major accidents occurred. Those reporting the occurrence of a minor accident were far more likely to report the occurrence of a major accident. Nearly 40 percent of those reporting a minor

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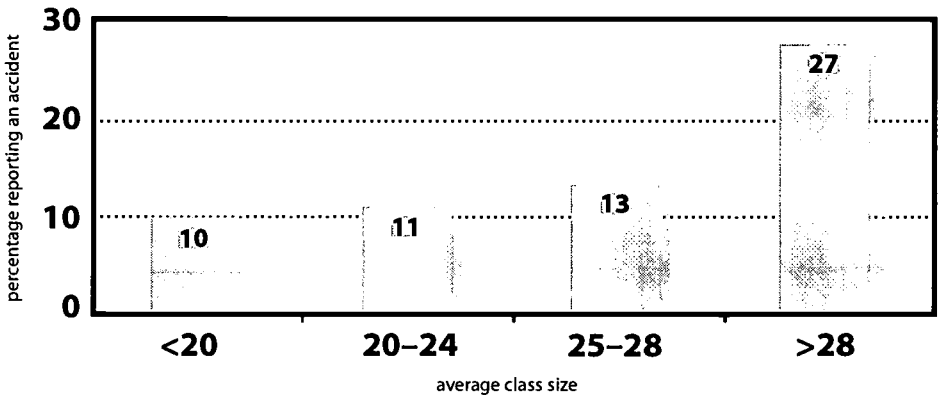
accident also reported a major accident, while less than five percent of those reporting no minor accident reported the occurrence of a major accident.

Approximately 21 percent of the teachers reported an average student-teacher ratio of less than 20 students. At the other end of the continuum, approximately eight percent of the teachers reported a student-teacher ratio of greater than 28 students. When class size was compared to reported occurrences of major accidents, those teachers with 28 or more students were almost three times as likely to report a major accident as those with 20 or fewer students, as shown in Graph 3.

Graph 3: Percentage of respondents reporting the occurrence of a major accident by average class size



Other than class size, no other factors appeared to be associated with an increase in major accidents over the past five years based on this survey. However, the relatively low number of teachers (59) reporting the occurrence of a major accident made finding relationships difficult. A larger sample of responses would shed more light upon the factors associated with the occurrence of major accidents.

Types of Accidents

The most common types of accidents, regardless of whether they were considered major (medical attention required) or minor (no medical attention required), were broken glass, heat burns, and foreign material in the eyes. Specifically, of those teachers reporting the occurrence of either a minor or major accident, 33 percent reported broken glass, 19 percent reported heat burns, and 13 percent reported foreign material in the eyes. Of those teachers reporting the occurrence of an accident, approximately five percent reported explosions, chemical burns, faulty equipment causing injury, electrical shock, or ingestion of foreign material.

Teachers also recorded if they had to evacuate their classrooms or laboratories because of chemical fumes. Eleven percent of all science teachers and 15 percent of chemistry teachers in the survey reported that they had evacuated their classrooms or laboratories within the past year.

Compliance with Laboratory Safety Laws Regarding Equipment, Chemical Storage, and Training

Science teachers in grades 9–12 must, by law, devote at least 40 percent of their instructional time to laboratory and field investigations, thus there is a clear need for compliance with the laws and regulations governing lab safety. [14] Many laboratory safety laws and regulations focus on the availability and use of safety equipment, the storage of chemicals, and the physical space in which science investigations occur. Respondents answered a variety of questions related to these issues. [15]

Safety Equipment

The survey asked respondents to report on the availability and use of safety equipment required by law or regulation. Survey respondents indicated which safety equipment was actually available and used in their schools.

Table 3 shows that fairly large percentages of teachers of all science courses and teachers of chemistry report the lack of availability of required safety equipment. This suggests that many schools are not in compliance with current laws and regulations regarding science safety equipment.

Table 3: Percentage of teachers reporting the lack of availability of required safety equipment

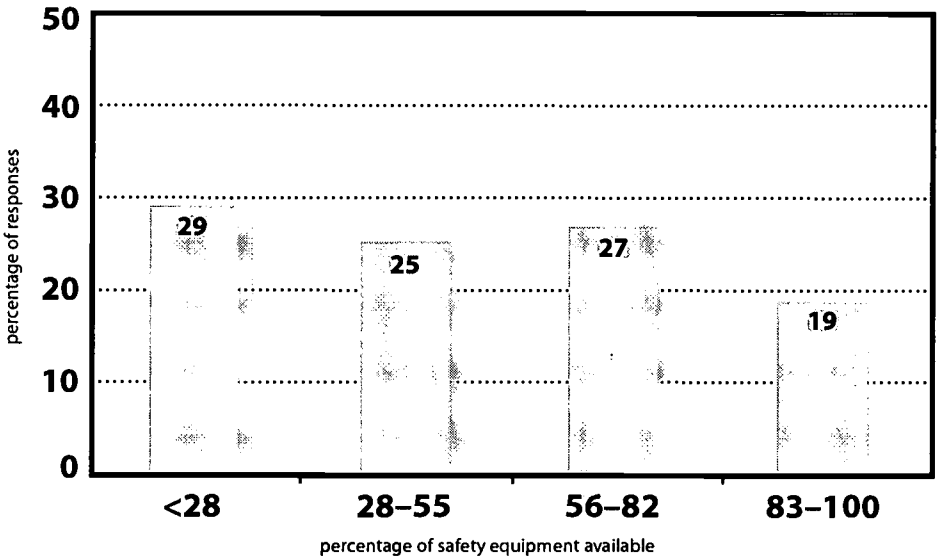
type of safety equipment	percentage of respondents reporting lack of availability	
	all science courses	chemistry
safety goggles	17%	11%
fire extinguisher	21%	11%
eyewash	17%	20%
first-aid kit	34%	30%
fire blanket	40%	26%
goggle sterilization	48%	40%
safety shower	60%	32%
corrosives cabinet	63%	43%
flammables cabinet	63%	46%
fume hood	64%	36%
chemical spill kit	76%	61%

As demonstrated by Graph 4, approximately 54 percent of the respondents reported that their school had less than 55 percent of the required laboratory safety equipment. Only 19 percent reported that their school had at least 84 percent of the required laboratory safety equipment.

Teachers in schools with large student enrollments (greater than 1,500 students) had greater percentages of laboratory safety equipment available than small schools (less than 1,000 students). In fact, teachers in large schools reported having nearly 70 percent of the required

laboratory safety equipment, while teachers in small schools reported having less than 50 percent of the required safety equipment.

Graph 4: **Percentage of all respondents reporting the availability of selected safety equipment**



Respondents had an opportunity to answer questions about the courses in which safety goggles are used and the frequency of use. Law requires teachers and students to wear safety goggles when engaged in three types of activities: using chemicals, conducting dissections, or grinding/ chipping solid materials.[16] Thirty-six percent of respondents reported that they require students to use goggles during all three of these activities. Nearly 12 percent of the teachers reported they do not require students to use goggles during any of these activities. The percentages of teachers requiring the use of goggles for these activities are represented in Table 4. The percentages responding to required safety goggle use for different numbers of these activities is detailed in Table 5. There were no differences in the percentages of goggle use between urban, suburban, or rural teachers.

Table 4: **Use of safety goggles by course**

science discipline	activity	percentage required
physical sciences	using chemicals	77%
life sciences	dissecting	54%
earth sciences	grinding/chipping	60%

Table 5: **Percentage of respondents indicating the use of goggles by number of activities**

number of activities in which goggle use is required	percent requiring
never require use of goggles	12%
require goggle use during one activity only	22%
require goggle use during two activities	30%
require goggle use during all three activities	36%

Chemical Storage

Regulations require that certain types of chemicals be stored in an area separate from the laboratory or classroom in a locked storage cabinet or facility that only teachers can access. [17] Eighty-one percent of the teachers reported storing chemicals in a separate area, 75 percent reported storing chemicals in a locked storage room, and 87 percent reported that students did not have access to chemicals. Teachers in urban and suburban schools were more likely than teachers in rural schools to store chemicals in a separate area and to store them in a locked storage room.

Teacher and Student Laboratory Safety Training

According to the Texas Hazard Communications Act (HAZCOM), all science teachers new to a school are required to participate in professional development activities focused on laboratory safety. [18] In addition, the Texas Essential Knowledge and Skills require students to exhibit a high level of knowledge about laboratory safety. [19] The survey included questions related to teacher and student laboratory safety training.

Teacher Professional Development Participation

Thirty-three percent of the respondents reported attending professional development activities concerning safety during the 2000–2001 school year. This low percentage may be due to the administration of the survey early in the school year. While there was no relationship between community type and professional development participation, teachers in larger schools were more likely to participate in safety professional development activities than teachers in smaller schools.

Of those teachers receiving professional development, 20 percent reported professional development activities in all four required areas of HAZCOM (material safety data sheets, labeling of chemicals, proper storage of chemicals, and proper disposal of chemicals). [20] The most frequently mentioned area of knowledge (30 percent) was material safety data sheets. By law, all schools must have material safety data sheets (MSDSs) that include a description about each chemical in the school, the hazards associated with each chemical, and how each chemical should be stored and disposed. [21] While all schools are required to have MSDSs, only 75 percent of all science teachers and 82 percent of chemistry teachers reported that there were MSDSs in their schools. There were no differences by community type, but teachers in larger

schools (89 percent) were more likely than teachers in smaller schools (68 percent) to have the MSDSs on file in their schools. Of the teachers reporting the existence of the MSDSs in their schools, 80 percent knew where the MSDSs were actually located.

Student Mastery of Safety Rules

The Texas Education Agency and professional organizations recommend that students be tested on their knowledge of laboratory safety before starting any laboratory investigation. Of those responding to this survey, approximately 80 percent tested their students' mastery of laboratory safety procedures. Specifically, 19 percent considered a grade of "100" as an indication of student mastery of laboratory safety knowledge, while 26 percent considered a grade of "70" to be an adequate indication of mastery. In addition, 15 percent and 20 percent considered grades of "80" and "90" to be acceptable indicators of mastery. There was no difference between urban, suburban, or rural teachers in whether they test for mastery of student laboratory safety knowledge.

The Texas Education Agency and professional organizations also recommend that students and teachers review laboratory safety procedures before each laboratory investigation. Of those responding to this survey, nearly 88 percent reported that they "always" or "usually" reviewed laboratory safety procedures before each investigation was started. Only three percent of respondents reported "rarely" or "never" reviewing laboratory safety guidelines. There were no differences among the responses of urban, suburban, or rural teachers.

Science Classroom and Laboratory Space

State laws and regulations require a certain amount of square footage that classrooms and combined classrooms/laboratories must have for conducting science investigations.[22] The required sizes are detailed in Table 6.

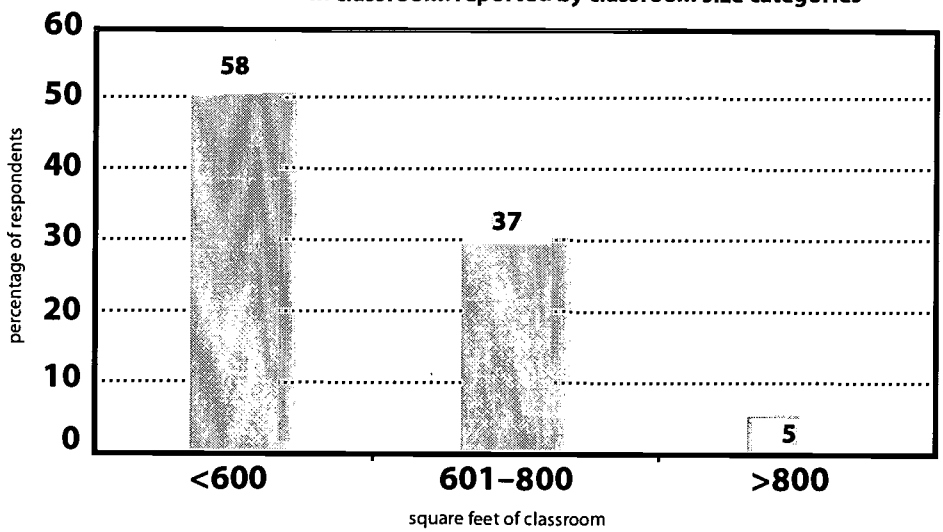
Table 6: Science classroom and classroom/laboratory size required by statute

classrooms only				science lecture–laboratory combination			
Grade Level	Square Feet	Square Feet per Student	Student/ Teacher Ratio	Grade Level	Square Feet	Square Feet per Student	Student/ Teacher Ratio
PK–1	800	36	22:1	K–5	900	41	22:1
2–5	700	30	22:1	6–8	1000	50	22:1
6–12	700	28	none	9–12	1200	50	25:1

As shown in Graph 5, 58 percent of the teachers who conducted science investigations in their classrooms reported that their classroom was 600 square feet or smaller. Only five percent of teachers reported that their classroom was more than 800 square feet. These reports suggested that a large number of classrooms across the state did not meet the current size requirements set

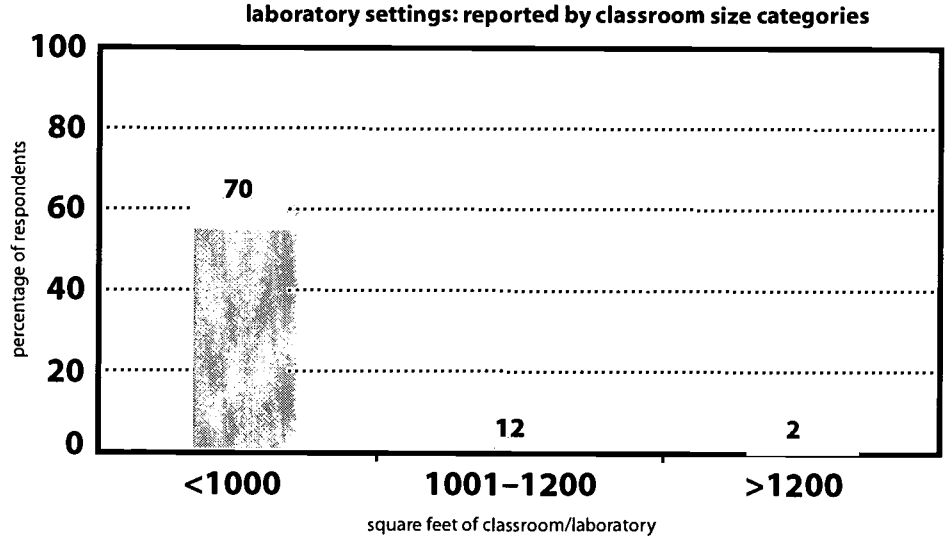
forth by statute. Many of these classrooms may be in schools that were constructed before the adoption of current laws and regulations.

Graph 5: **Percentage of teachers conducting investigations in classroom: reported by classroom size categories**



Graph 6 shows that 70 percent of teachers conducting investigations in a combination classroom/ laboratory reported a space of less than 1,000 square feet. Two percent of teachers conducting investigations in a combination classroom/laboratory reported that the square footage of their classroom/laboratory exceeded 1,200 square feet. Again, the data suggested that a large percentage of classroom/laboratory settings did not meet the current statute requirements.

Graph 6: **Percentage of teachers conducting investigations in classroom/ laboratory settings: reported by classroom size categories**



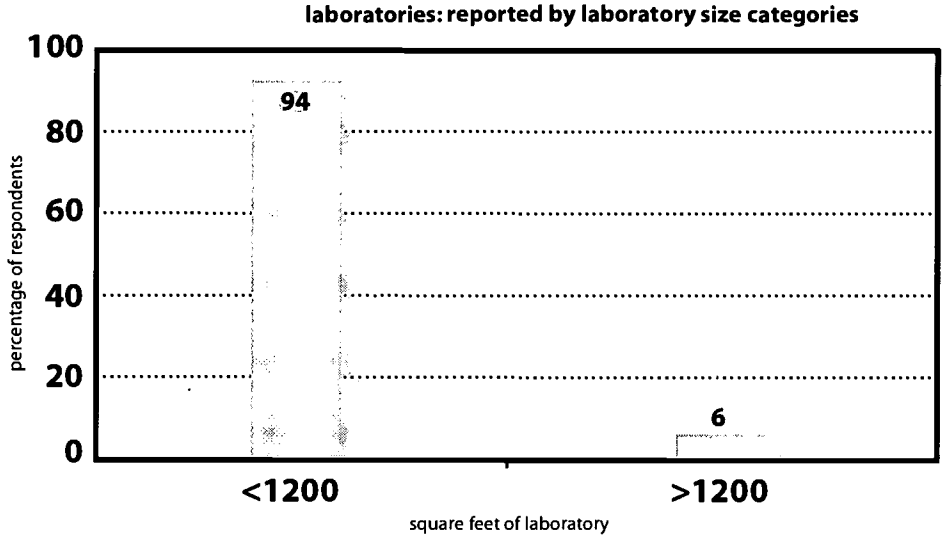
Recommendations are also in place that dictate the physical size of nonclassroom laboratory settings in which science investigations are conducted. These are detailed in Table 7.

Table 7: Science laboratory sizes recommended by TEA and professional organizations

Grade Level	Square Feet	Square Feet per Student	Student/ Teacher Ratio
K–5	1100	40	22:1
6–8	1250	45	25:1
9–12	1250	50	25:1

As shown in Graph 7, nearly 95 percent of teachers conducting science investigations in laboratories reported a square footage of less than 1,200. This information suggested that very few laboratories in Texas public schools met the current physical size recommendations of the TEA and professional organizations.

Graph 7: Percentage of teachers conducting investigations in laboratories: reported by laboratory size categories



Compliance with Laboratory Safety Recommendations

Some laboratory safety standards are determined by laws and regulations, while others are governed by recommendations and guidelines set forth by the Texas Education Agency and professional organizations such as the National Science Teachers Association. Ventilation systems, classroom-to-office communication systems, and nurse availability are some of the critical areas of laboratory safety governed only by recommendations and guidelines. [23]

Availability of a Ventilation System

Ventilation systems are highly recommended for laboratories or storage areas in which chemicals are used or stored. Of those responding to the survey, 57 percent reported the existence of a ventilation system in rooms where laboratory investigations take place. There was little difference in the availability of a ventilation system between urban, suburban, and rural schools, or between schools of different sizes.

Availability of a Classroom-to-Office Communication System

Sixty-seven percent of respondents reported having a communication system in place that would allow them to notify office personnel immediately if an accident occurred. There was little difference in the availability of a communication system between urban, suburban, and rural schools, or between schools of different sizes.

Availability of a Nurse

Close to 90 percent of the teachers reported the availability of a full- or part-time nurse. Of those reporting a nurse, 87 percent reported the availability of a full-time nurse. Suburban schools were far more likely to have a nurse of any kind and a full-time nurse than either urban or rural schools. The percentages reporting the availability of a nurse by community type are shown in Table 8.

Table 8: Availability of nurse

Community Type	Available Nurse	Type of Nurse	
		Full Time	Part Time
Urban	88%	90%	10%
Suburban	95%	96%	4%
Rural	77%	87%	12%

Conclusions and Recommendations

Survey findings suggest a relationship between student-teacher ratios and the occurrence of both minor and major accidents. In general, as class sizes (student-teacher ratios) increase, so does the occurrence of both minor and major accidents. Similarly, there is a relationship between student enrollment and the occurrence of minor accidents. In general, as student enrollments increase, so does the occurrence of minor accidents. Aside from these confirmations of earlier research on student-teacher ratios and laboratory accidents, this survey indicates that science student-teacher ratios are too large to conform to current state laws and Texas Education Agency recommendations promoting a safe learning environment

In addition, a large percentage of schools follow neither the state laws and regulations governing laboratory safety, nor the recommendations set forth by the Texas Education Agency or the

National Science Teachers Association. Specifically, many schools are not conforming to laws and recommendations regarding the availability and use of safety equipment, proper storage of chemicals, laboratory size, and the existence of ventilation systems and classroom communication systems.

Low numbers of teachers are completing professional development activities focused on laboratory safety, and not all teachers are requiring students to exhibit knowledge of laboratory safety before conducting science investigations. Also, not all schools have material safety data sheets, and in schools that have the sheets, only 80 percent of the teachers know where to find the sheets.

These conclusions suggest several recommendations to improve laboratory safety in Texas schools:

- Strengthen state safety regulations and resume the systematic monitoring of science facilities and safety procedures in public schools by the Texas Education Agency.

Evidence gathered in this study shows that some science teachers do not participate in annual professional development focused on safety. Additionally, many science teachers and students lack access to required safety equipment. Strengthened regulations and regular monitoring can assist schools in identifying deficiencies and encourage prompt compliance with requirements.

- Texas school districts constructing or remodeling school buildings should provide science laboratories of the appropriate size (50 square feet per student) and with appropriate storage space (15 square feet per student) and ventilation.

Evidence presented in this report suggests that accidents can be reduced or avoided by having appropriate physical facilities for science teaching and handling science materials. Facility planners should follow TEA recommendations regarding science laboratory floor space and storage facilities. In particular, ventilation systems should be installed in all laboratories and storage areas where hazardous chemicals are used or stored.

- Reduce the teacher-student ratio in middle school and high school science classes.

Teacher reports of accidents in science classes indicate a positive and direct relationship between the number of students in a science class and the number of accidents that occur. Research suggests that an appropriate limit to the student-teacher ratio for science instruction is 25-to-1 in middle school and high school.

Citations

[1] Interviews with students about their high school laboratory experiences, Fall 2000.

[2] 19 TAC § 247. Educator's Code of Ethics

[3] 19 TAC § 38.005. Protective Eye Devices in Public Schools

[4] 25 TAC § 295. Standards for Face and Eye Protection in Public Schools

[5] 19 TAC § 74.3. Description of Required Secondary Curriculum

[6] 19 TAC § 61.1033 (a–f). School Facilities Standards

[7] 25 TAC § 501. Hazardous Substances

[8] 25 TAC § 502. Hazard Communications Act

[9] 101 NFPA (National Fire Protection Association) 45. Life Safety Code

[10] http://www.tenet.edu/teks/science

[11] Ward, Susan, and West, Sandra S. (1990, May). Science Laboratory Safety Survey. *The Texas Science Teacher,* 19(2), 9-13. (Written with Carolyn J. Pesthy.)

[12] The survey specified only the courses Integrated Physics and Chemistry, Biology, Chemistry, or Physics. All other classes were designated under Other.

[13] West, Sandra S. (1991, September). Lab Safety. *The Texas Science Teacher,* 58(6), 45–49.

[14] 19 TAC § 74.3. Description of Required Secondary Curriculum

[15] Texas Education Agency and the Charles A. Dana Center (2000). *Texas Safety Standards: Kindergarten through Grade 12.* Austin, Texas: Texas Education Agency.

[16] 19 TAC § 38.005. Protective Eye Devices in Public Schools

[17] 25 TAC § 501. Hazardous Substances

[18] 25 TAC § 502.009. Hazard Communications Act

[19] 19 TAC § 74.1. Essential Knowledge and Skills

[20] 25 TAC § 502.009. Hazard Communications Act

[21] 25 TAC § 502.009. Hazard Communications Act

[22] 19 TAC § 61.1033. School Facilities Standards

[23] Texas Education Agency and the Charles A. Dana Center (2000). *Texas Safety Standards: Kindergarten through Grade 12.* Austin, Texas: Texas Education Agency.

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The Charles A. Dana Center is an organized research unit in the College of Natural Sciences at The University of Texas at Austin. The Dana Center is dedicated to strengthening education and civic life in Texas. It serves as an incubator of innovative programs and practices designed to support state and local agencies, school districts, and civic organizations as they work together to serve Texas communities in ways that reflect their local values. Toward this end, the Dana Center conducts applied research, develops resources, offers technical assistance, provides information to policymakers, and convenes individuals and groups to work together to strengthen education for all Texas students.

For a more technical report explaining sample sizes and statistical methods, contact the authors of this report at the Charles A. Dana Center.

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