

# **Laboratory Safety and Teacher Certification**

By

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## **Summary**

The Laboratory Safety Institute (LSI) has completed a multi-year study of the States' certification requirements for science teachers. Only eight out of 57 States and Territories (12%) have a written requirement that a person must know something about lab safety to become a certified science teacher in their jurisdiction. LSI believes that the "Next Generation" of science teacher must be required by state and federal government certification programs to know and understand lab safety.

## **Introduction**

There are two myths in education: the administrator myth and the student myth. Administrators mistakenly believe that because their science, art and engineering faculty went to school for a long time, they know about lab safety and will make sure that students are not harmed. Student mistakenly believe that because their science, art and engineering faculty went to school for a long time, they know about lab safety and will make sure that students are not harmed. In many cases, both administrators and students are sorely mistaken.

In the late seventies, the National Institute of Occupational Safety and Health (NIOSH) and the Council of State Science Supervisors (CSSS, [www.csss-science.org](http://www.csss-science.org)) collaborated on a project to develop a lab safety training program and course text for school science teachers. Their goal was to train all the school science teachers in the United States. Frank Kizer was the CSSS Executive Director at the time and instrumental in the project. Jack Berberich and Glenda White at NIOSH were both very involved in the project. They presented the initiative at the American Chemical Society (ACS) spring meeting in Anaheim, CA in 1978.

I had been working for the Dow Chemical Company (1973-77) where I became increasingly concerned about the stark differences between lab safety practices in academia and the chemical industry. Joining the Science Division faculty at Curry College (Milton, MA) in the fall of 1977, I was fortunate to be able to attend that ACS meeting and the NIOSH presentation.

LSI was founded (as the Laboratory Safety Workshop) at Curry during this same period to address my growing concerns about the teachers' lack of knowledge about lab safety. LSI subsequently became involved in the presentation of the NIOSH/CSSS course for Massachusetts science teachers.

During that same general timeframe, a survey (origin unknown) was conducted of state departments of education. The departments were asked whether their state had a written requirement that teachers must know anything about laboratory safety to become certified. Twenty-four replied “no” and twenty-six did not reply.

This sorry state of affairs was further reflected in the higher frequency of lab accidents in school, college, and university science labs. LSI’s estimate based on anecdotal accounts and private conversations with school faculty and administrators was that the frequency was 10 to 100 times greater than in the chemical industry.

## **The Study**

A few years ago, LSI decided to repeat the study to determine the current status of state certification requirements. Over the past several years, LSI polled the members of the Council of State Science Supervisors. Five separate inquiries to all states and territories produced the following result:

The question: Does your state have a written requirement that science teachers must know anything about laboratory safety to become certified?”

<b><u>Response</u></b>	<b><u>State</u></b>	<b><u>Territory</u></b>
Yes	8	0
No	41	1
No Reply	0	6
Recommended	1	0

### **States with Lab Safety Teacher Certification Requirements**

The italicized responses below were provided by those who answered affirmatively to the questions in the survey. They provide examples of how some states have addressed this issue.

#### **Arizona**

*Certification requirements for all secondary science teachers in Arizona include a content knowledge test in the area of certification. In each of the science content tests required for certification, one of the indicators in the Test Framework - under Understand Principles and procedures of scientific inquiry – has a focus on safety. Below is an example from the Biology content test framework. Similar language is also present in the Chemistry, Physics, Earth Sciences, and Middle Grades General Science exams.*

- ▶ Demonstrate knowledge of safety procedures and hazards associated with biological investigations and the materials, equipment, technology, and disposal methods used in biology.

[http://www.nestest.com/Content/Docs/NES\\_Framework\\_305.pdf](http://www.nestest.com/Content/Docs/NES_Framework_305.pdf)

A list of all the Arizona Educator tests can be found at <http://www.azed.gov/educator-certification/files/2014/04/arizonaeducatorexamsupdateh-o.pdf?20141023>

## **Colorado**

*In Colorado, in our science teaching certification standard,s it says that “The science educator is knowledgeable about and is able to effectively demonstrate and instruct to students about safety considerations in science instruction and in the science classroom, including, but not limited to:*

*Proper use, storage and disposal or maintenance of biological chemical and scientific equipment and specimens and is able to:*

*Instruct and supervise students in the proper preparation and use of laboratory equipment and materials*

*Evaluate laboratory settings, equipment, materials and procedures, to identify and manage the resolution of potential safety hazards*

*Provide solution to equipment problems, with the ability to make minor adjustments in the operation of equipment*

*Incorporate, into planning, information related to state and federal regulations, legal issues, and guidelines pertaining to scientific materials and specimens*

*University programs must provide evidence that this is taught to perspective teachers for the program to be certified by the state in secondary science education (although this check has not been as thorough in recent years as it might have been).*

## **Michigan,**

*In Michigan, in order to be certified to teach, Teachers must go through an MDE "approved" sequence of specific courses meeting specific standards in their university program. One of our standards that must be addressed in the teacher's preparation is*

6.0	<i>understand and promote the maintenance of a safe science classroom as identified by the Council of State Science Supervisors, including the ethical and appropriate use and care for living organisms and scientific equipment, and the safe storage, use, and disposal of chemicals;</i>
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*I took this one from our elementary certificate, integrated science endorsement, but they all have a similar piece in them.*

### **Minnesota**

*The Minnesota standards for a science license include lab safety. Colleges that recommend candidates for licenses must show that it is included in their course syllabi.*

### **Montana**

*For Montana the Administrative Rule of Montana, set forth by the Board of Public Education, indicates that teacher preparation program for science ensures that ...*

- 2) The science endorsement requires that successful candidates:*
- (d) Demonstrate understanding and experience of how to develop and maintain the highest levels of safety in classrooms, stockrooms, laboratories, and other areas related to instruction in science;*

*There is not a specific course mandated in rule, rather the teacher preparation programs have to include proper coursework in their programs to ensure candidates are able to do what is described above.*

### **New Hampshire**

*We require lab safety training for science certification and it has been strengthened in our new standards (to take effect 7/1/09) that requires them to have training in science safety including how to teach safety to their student and maintain a safe classroom environment.*

*In the past many of our Teacher Training institutions allowed student to take their science safety class for credit toward this but that only permitted them to be safe themselves in the labs they were taking.*

## **North Dakota**

*It is in the Standard .8 of each Science Area ....Environment for Learning.*

**13010.8, 13020.8, 13035.8, 13045.8, 13047.8, 13050.8**

### **ENVIRONMENT FOR LEARNING**

*The program prepares candidates to design and manage safe and supportive learning environments in the classroom, laboratory, and field. The program reflects high expectations for the success of all students. The program uses varied performance assessments of candidate's understanding and ability to apply that knowledge.*

*Examples of performance assessments may include how to:*

- *maintain a positive classroom environment conducive to the learning of science;*
- *identify and promote the elements of an engaging and stimulating science learning environment;*
- *plan and develop opportunities for students to investigate and learn from resources, artifacts, exhibits, events, displays and the environment;*
- *structure age-appropriate laboratory and field experiences for students;*
- *help students understand the appropriate use of scientific equipment and materials;*
- *set up procedures for safe handling, labeling and storage of chemicals, electrical equipment, and other materials and know actions to take to prevent or report an emergency;*
- *demonstrate knowledge of legal responsibilities and know how to act to prevent potential problems with liability and negligence, especially as applied to science teaching;*
- *practice the safe and ethical use and care of animals for science instruction within the standards and recommendations of the science community and applicable regulations.*

## **Utah**

Utah does have a requirement. We require training and certification of that training. I know we specify somewhere what should be contained in that training.

## **States with Lab Safety Teacher Certification Recommendations**

### **Maryland**

*Maryland does not have a formal state certification. However, use of the guidelines contained in the document at the "Offsite Teaching and Learning Resources" link on the state website at <http://mdk12.org/instruction/curriculum/science/safety/index.html> is strongly recommended.*

## **Nebraska**

*The following is one of the recommended guidelines for inclusion as part of the course of study for all science endorsements offered by a Nebraska Higher Educational Institution.*

*B. Design and manage safe and supportive learning environments reflecting high expectations for the success of all students, including being able to:*

- 1. Manage physical spaces within which science learning occurs;*
- 2. Demonstrate proper treatment and ethical use of living organisms; and*
- 3. Demonstrate safety in all areas related to science instruction;*

## **South Carolina**

*South Carolina does not have a lab safety requirement in order to be certified. (I think it is a good idea though) We do have standards for lab safety and in the support guide to the standards we recommend that all science teachers attend our State Dept of Ed one day (7 hours) lab safety institute.*

*We offer the institute along with a CD on lab safety for five days (two days have an elementary focus and three days have a secondary focus) during the month of June and in connection with our State Science Conference in the fall. We have provided the institutes for ten years and train approximately 200-300 teachers each year.*

## **Conclusions and Recommendations**

After nearly 40 years, we have made a small amount of progress. Eight states (16%) require science teachers to know something about lab safety to become certified in their states. Three states (6%) have this as a recommendation. Clearly this is an improvement over zero. However, 42 states and seven territories have not yet mandated that their science teacher must know anything about lab safety to be certified. In most secondary schools, in all fifty states, a score of 16% correct earns a grade of "F".

LSI hopes that the sharing of these eight examples of requirements and three recommendations will encourage some thoughtful discussion and lead to the other states taking action. The "Next Generation" of science teachers must be more knowledgeable about the fundamentals of lab safety and how to create more effective lab safety program.

School science teachers and their students must learn to care about health, safety, and the environment. They must learn to identify hazards and know how to protect themselves. They need to create safer, healthier, and more environmentally friendly places to learn, work, and live.

School science teachers must be able to answer four simple questions before performing demonstrations, conducting experiments, encouraging inquiry, and exploring nature:

1. What are the hazards?
2. What are the worst things that could happen?
3. What do I need to do to be prepared?
4. What are the prudent practices, protective facilities, and protective equipment needed to minimize the risk?

For its part, the Laboratory Safety Institute will continue several initiatives to improve health and safety in science education:

1. Donate complimentary copies of its Model Chemical Hygiene Plan to K-12 schools to help them to comply with the OSHA Lab Standard (29CFR1910.1450). All schools (including those not under state or federal mandates) should comply with this standard.
2. Offer other teacher resources include complimentary copies of LSI's "Laboratory Safety Guidelines", teacher friendly course pricing, and scholarships.
3. Give members of the Council of State Science Teachers (CSSS), complimentary LSI lab safety courses if they have not attended in the past five years.

And, here are two proposed new LSI initiatives to address our concerns:

1. LSI could create a certification exam covering what every new high school science teacher should know about lab safety. The exam could be used by state certification organizations and/or teacher preparation institutions.
2. LSI could publish a book, "1001 Questions: What every High School Science Teacher should know about Lab Safety"

For more information about LSI and its programs and services, visit LSI on the web at [www.labsafetyinstitute.org](http://www.labsafetyinstitute.org).

#### **\*About the Author**

James A. **Kaufman**, Ph.D., is the founder and CEO of the Laboratory Safety Institute (LSI) an international non-profit educational organization for safety in science and science education. He has spent much of the past 40 years working to make health and safety an integral and important part of science education. Please send your lab safety questions and concerns to him at [jim@labsafetyinstitute.org](mailto:jim@labsafetyinstitute.org).