

Chapter 1

Laws, Rules, and Regulations

According to the National Science Education Standards, students at all grade levels should engage in scientific inquiry to gain an understanding of scientific concepts and acquire science process skills. They can not acquire these skills merely by reading a textbook; in addition, they must experience meaningful investigations in laboratory and field settings.

Well-designed science facilities provide students with a safe learning environment for laboratory and field investigations. This chapter presents requirements and recommendations for constructing science facilities in Texas school districts. Chapter 2 presents regulations and recommendations regarding classroom and laboratory space and accessibility for all students.

“Students at all grade levels and in every domain of science should have the opportunity to engage in scientific inquiry to gain an understanding of scientific concepts and acquire science process skills. They can not acquire these skills merely by reading a textbook; in addition, they must experience meaningful investigations in laboratory and field settings. Well-designed science facilities provide students with a safe learning environment for laboratory and field investigations. This chapter presents requirements and recommendations for constructing science facilities in Texas school districts. Chapter 2 presents regulations and recommendations regarding classroom and laboratory space and accessibility for all students.”

National Research Council, *National Science Education Standards*, 1996

Curriculum-Based Designs

Designs for science facilities should be based on the requirements listed in a school district’s educational program and on the student population that the facilities serve. Chapter 112 of the Texas Administrative Code provides teachers with standards for science. These standards, the Texas Essential Knowledge and Skills (TEKS) for Science, specify what all students should know and be able to do in kindergarten through grade 12 science. The TEKS are part of a district’s educational program and provide local school districts with the foundation for their science curriculum.

The TEKS were intentionally written with active verbs—such as *demonstrate*, *conduct*, *investigate*, *manipulate*, and *observe*—that make it difficult, if not impossible, for students to learn science without doing hands-on laboratory and field investigations. Architects and engineers can use the activities described in this chapter as a guide for designing the kinds of facilities districts require.

Elementary School Science Curriculum

The science standards for elementary school provide students with ways to explore the natural world through curricula based on integrated relationships that exist among the science disciplines. It is important for students to relate what they learn in science classes to what they experience outside the school setting. School districts must provide well-designed science facilities that support students' work in laboratory investigations involving life, earth/space, and the physical sciences.

The National Science Teachers Association (NSTA) recommends that a minimum of 60 percent of the instructional time be devoted to laboratory investigations. However, the Texas Education Agency gives each school district the authority to establish the percentage of time elementary students will spend doing hands-on laboratory and field investigations.

The following information represents a summary of the content requirements for elementary school science and can serve as a guide to the types of facilities that are necessary in order for students to meet the state standards for science. The complete TEKS for science are included as Appendix A.

Kindergarten

Students participate in simple classroom and field investigations safely to develop skills to do scientific inquiry, and to use critical thinking to make decisions. They use their own senses, common tools, and models to make observations and collect information. In addition, they use computers and other technology to support their investigations.

They identify components of the natural world, including rocks, soil, and water. Students observe changes in the seasons and in the growth of plants and animals, and they explore the basic needs of living organisms. They actively participate to identify organisms and objects; manipulate parts of objects; group living organisms and nonliving objects; and observe life cycles in plants and animals.

First Grade

Students in first grade conduct classroom and field investigations safely to develop skills to do scientific inquiry, and to use critical thinking to make decisions. They use tools, including computers and models to observe, describe, and measure objects and organisms.

Students measure, manipulate, and sort objects and organisms. They distinguish, group, and compare living organisms and nonliving objects, identify the basic needs of living organisms, and compare the ways in which living organisms depend on each other.

They engage in activities to identify components of the natural world including streams, lakes, and oceans. They observe rocks and soil samples; they measure changes that result from the application of heat, that occur during different weather and seasons, and that occur during the life cycles of organisms.

**Table 1.1
Kindergarten Laboratory Materials and Safety Equipment**

Safety Equipment	
<p style="text-align: center;"><i>Required</i>¹</p> <ul style="list-style-type: none"> • Eye/face washes • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggles • Safety goggle disinfecting equipment or materials: soap and water, bleach solution, hot water 	<p style="text-align: center;"><i>Recommended</i>²</p> <ul style="list-style-type: none"> • Sinks • Transport carts
Materials and Equipment	
<p style="text-align: center;"><i>Required</i>¹</p> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Balances • Bowls, plastic • Computers • Cups (paper or plastic) • Hand lenses 	<p style="text-align: center;"><i>Recommended</i>²</p> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Aquarium and accessories • Clocks • Egg incubators • Scissors, primary • Terrarium and accessories <p><u>Consumables</u></p> <ul style="list-style-type: none"> • Aluminum foil • Bags, plastic with zipper seals • Construction paper • Crayons, wax • Nails, small • Paste • Potting soil • Soil samples • Spoons, plastic • Strings for measurement • Textured materials, such as sand paper, silk <p><u>Audiovisuals</u></p> <ul style="list-style-type: none"> • Personal growth graph
<p>¹FYei]fYXlrc`gUFYgdVWUX]b`h YH9? G`.....</p> <p>²FYWa a YbYX`]ggcZlrc`gk fY[YbYUHXVmiUbUm]b[`h YWbWdhH9? G`</p>	

Table 1.2
First Grade Laboratory Materials and Safety Equipment

Safety Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Required¹</div> <ul style="list-style-type: none"> • Eye/face washes • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggle disinfecting materials or equipment, including soap and water, bleach solution, hot water • Safety goggles, splash-proof 	<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <ul style="list-style-type: none"> • Sinks • Transport carts
Materials and Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Required¹</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Balances • Clocks with second hand • Computers • Hand lenses • Thermometers; non-rolling, non-mercury 	<p><u>Living/preserved specimens</u></p> <ul style="list-style-type: none"> • Animals and plants • Seeds such as peas, corn and beans <p><u>Consumables</u></p> <ul style="list-style-type: none"> • Aluminum foil • Bags, plastic with zipper seals • Bowls, plastic • Construction paper • Crayons, wax • Cups (paper and plastic) • Ice source • Nails, small • Measuring objects (string, paper clips, washers) • Paste • Potting soil • Rock samples • Scissors, primary • Spoons, plastic • Soil samples: sand, silt, clay, loam • Textured objects, such as sand paper, silk, wax paper <p><u>Audiovisuals</u></p> <ul style="list-style-type: none"> • Pictorial graph • Video, <i>Sources of Water</i>
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Aquarium with accessories • Beakers, plastic, 250 mL • Bodkin needles and thread • Bowls, plastic • Construction blocks • Egg incubators • Eyedroppers, plastic • Geometric shapes sets, colored • Lamps or light sources • Magnet sets • Metal samples, including iron • Metric rulers • Noise-making devices • Terrarium and accessories 	

¹FYei]fYXlrc`gUFYgdVWUX]b h YH9? G'.....
²FYWa a YbYX`]ggcZlrc`gk fY[YbYUHXVmiUbUm]b[h YWbWdhH9? G'

Second Grade

Students in second grade conduct classroom and field investigations safely to develop skills to do scientific inquiry, and they use critical thinking to make decisions. They use tools and models to observe, describe, and measure objects and organisms. In addition, they use computers and other technology to support their investigations.

They identify and illustrate components and processes of the natural world, including the water cycle and use of the earth's resources. Students engage in activities to observe and measure change that occurs during melting and evaporation, weathering, and the pushing and pulling of objects.

Students distinguish between the characteristics of living organisms and nonliving objects, compare needs of plants and animals, and identify parts and characteristics of plants and animals to gain an understanding of how living organisms depend on their environments.

Third Grade

Third-grade students conduct field and laboratory investigations safely using environmentally appropriate and ethical practices. Students develop skills to do scientific inquiry, and they use information, critical thinking, and scientific problem-solving skills to make decisions. In addition, they use computers and other technology to support their investigations and repeat investigations to increase the reliability of their results.

They identify components of the natural world, including rocks, soil, water, and atmospheric gases. Students participate in activities to observe the direction and position of objects as they are pushed and pulled, and the movement of the Earth's surface, as examples of changes caused by a force. They investigate magnetism and gravity and use models to represent the natural world.

Students conduct activities to explore organisms' needs, habitats, and competition with other organisms within the same ecosystem. In addition, they observe characteristics among species that allow each species to survive and reproduce, and they investigate how species adapt to change. They identify inherited traits in plants and animals.

Table 1.3
Second Grade Laboratory Materials and Safety Equipment

Safety Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Required¹</div> <ul style="list-style-type: none"> • Eye/face washes • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggle disinfecting materials or equipment, including soap and water, bleach solution, hot water • Safety goggles (splash-proof) 	<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <ul style="list-style-type: none"> • Sinks • Transport carts
Materials and Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Required¹</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Hand lenses • Clocks • Computers • Balances • Thermometers; non-rolling, non-mercury 	<p><u>Living/preserved specimens</u></p> <ul style="list-style-type: none"> • Animals and plants • Seeds, such as peas, corn and beans <p><u>Consumables</u></p> <ul style="list-style-type: none"> • Aluminum foil • Bags, plastic with zipper seals • Bowls, plastic • Construction paper • Crayons, wax • Cups (paper and plastic) • Ice • Nails, small • Measuring objects (string, paper clips, washers) • Paste • Potting soil • Rock samples • Scissors, primary • Spoons, plastic • Soil samples: sand, silt, clay, loam • Textured objects, such as sand paper, silk, wax paper
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Aquarium with accessories • Beakers, plastic, 250 mL • Bodkin needles and thread • Bowls, plastic • Construction blocks • Egg incubators • Eyedroppers, plastic • Geometric shapes set, colored • Lamps or light sources • Magnet sets • Metal samples including iron • Metric rulers • Terrarium and accessories • Noise-making devices 	<p><u>Audiovisuals</u></p> <ul style="list-style-type: none"> • Graph, pictorial • Video, <i>Sources of Water</i>

¹F Yei]fYXlrc`gUFYgdVWUX]b`h YH9? G".....
²F YWa a YbYX`]gYcZlrc`gk YFY[YbYfUHXXVmUbUm]b[`h YWbWdhH9? G"

**Table 1.4
Third Grade Laboratory Materials and Safety Equipment**

Safety Equipment	
<p style="background-color: #cccccc; padding: 2px;">Required¹</p> <ul style="list-style-type: none"> • Eye/face washes • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggle disinfecting materials or equipment, including soap and water, bleach solution, hot water • Safety goggles (splash-proof) 	<p style="background-color: #cccccc; padding: 2px;">Recommended²</p> <ul style="list-style-type: none"> • Sinks • Transport carts
Materials and Equipment	
<p style="background-color: #cccccc; padding: 2px;">Required¹</p> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Balances • Clocks • Computers • Hand lenses • Measuring cups • Meter sticks • Rulers, metric • Thermometers, non-mercury 	<p><u>Consumables</u></p> <ul style="list-style-type: none"> • Aluminum foil • Bags, plastic with zipper seals • Construction paper • Crayons, wax • Cups (paper) • Measuring objects (paper clips, string, washers, bolts) • Nails, small • Paste • Scissors, primary • Potting soil • Spoons, plastic • Soil samples: clay, loam, silt, sand
<p style="background-color: #cccccc; padding: 2px;">Recommended²</p> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Aquarium with accessories • Beakers, 250 mL • Cars, toy • Egg incubators • Eyedroppers • Fans, small • Flashlights • Light sources • Magnet sets • Musical instruments, rhythm band • Nails and hammers • Rock sample sets: sedimentary, igneous, and metamorphic • Terrarium and accessories • Thermometers, outdoor 	<p><u>Living/preserved specimens</u></p> <ul style="list-style-type: none"> • Animals and plants • Seeds such as peas, corn and beans <p><u>Audiovisuals</u></p> <p><i>Charts</i></p> <ul style="list-style-type: none"> • Constellation • Growth • Water cycle • Wind speed
<p>¹F Yei]fYXlcc`gUFYgdVWUX]b`h YH9? G'.....</p> <p>²F YWa a YbYX`]ggcZlcc`gk YF[YbYUHXVmiUbUm]b[`h YWbWdhH9? G'</p>	

Fourth Grade

Students conduct laboratory and field investigations safely using environmentally appropriate and ethical practices to do scientific inquiry. They use critical thinking and scientific problem-solving skills to make informed decisions. In addition, students use computers and other technology to collect and analyze information and repeat investigations to increase the reliability of their results.

They identify components and processes in the natural world, including properties of soils, effects of the oceans on land, and the role of the Sun as the major source of energy. In addition, students identify the physical properties of matter and observe that the addition or reduction of heat can cause changes in states of matter.

Students learn the roles of living and nonliving components in a simple system and investigate the differences between learned characteristics and inherited traits. They identify species of organisms that lived in the past and compare them to existing species.

Fifth Grade

Students conduct field and laboratory investigations safely according to environmentally appropriate and ethical practices and using tools and methods to do science inquiry. They use scientific methods and critical thinking and scientific problem-solving skills to make informed decisions. In addition, they use computers and other technology to support their investigations and repeat investigations to increase the reliability of their results.

They conduct activities to identify structures and functions of Earth systems including the crust, mantle, and core; and they investigate the effects of weathering on landforms.

Students learn how some past events have affected present events by exploring growth, erosion, and dissolution. They conduct activities to investigate magnetism, physical states of matter, and conductivity as ways of classifying matter. In addition, they learn about forms of energy, such as light, heat, and electricity.

Other activities include learning about adaptations that can improve the survival of members of a species, exploring an organism's niche within an ecosystem, and discovering a variety of traits that are inherited by offspring, as well as other characteristics that are learned.

¹FYei jfYXlrc`gfa Uhf]UgUbXyei]da YblUFYgdYUyX]b h YH9? G".....

²FYWa a YbYX`]g]cZlrc`gfa Uhf]UgUbXyei]da YblLk YfY| YbYUhxVmiUbUmm]b[h YWbWdhH9? G"

Table 1.5
Fourth Grade Laboratory Materials and Safety Equipment

Safety Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Required¹</div> <ul style="list-style-type: none"> • Eye/face washes • Fire blankets • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggle disinfecting materials or equipment • Safety goggles (splash-proof) 	<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <ul style="list-style-type: none"> • Sinks • Transport carts
Materials and Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Required¹</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Balances • Calculators • Cameras, disposable • Clocks with second hand • Compasses, magnetic • Computers • Meter sticks • Microscopes, stereoscopic • Rulers, metric • Sound recorders • Thermometers, non-mercury 	<p><u>Living/preserved specimens</u></p> <ul style="list-style-type: none"> • Animals and plants • Seeds, such as peas, corn and beans <p><u>Consumables</u></p> <ul style="list-style-type: none"> • Aluminum foil • Bags, plastic, with zipper seal • Clay, modeling • Construction paper • Crayons, wax • Cups (paper) • Glue, school • Nails, small • Paste • Pencils, colored • Potting soil • Salt and water for concentrations • Soil samples: clay, loam, sand, silt • Spoons, plastic • Straws • Sugar cubes
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Aquarium with accessories • Electric circuit kits • Beakers, plastic, graduated 250 mL and 1000 mL • Graphing mats • Hot plates • Incubators, egg • Lamps, aluminum reflector • Magnet sets • Mirrors, plastic • Scissors • Spinning tops with pump action • Rocks, limestone samples • Terrarium with accessories • Thermometers, outdoor • Weather vanes 	<p><u>Audiovisuals</u></p> <p><i>Charts</i></p> <ul style="list-style-type: none"> • Water cycle • Clouds • Wind speed • Vinegar • Constellations • Butterfly life cycle • Dinosaurs • Geologic time table <p><i>Videos</i></p> <ul style="list-style-type: none"> • Streams and rivers • Volcanoes • Tides and hurricanes

Table 1.6
Fifth Grade Laboratory Materials and Safety Equipment

Safety Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;"><i>Required</i>¹</div> <ul style="list-style-type: none"> • Aprons • Eye/face washes • Fire blankets • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggle disinfecting materials or equipment • Safety goggles (splash-proof) 	<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;"><i>Recommended</i>²</div> <ul style="list-style-type: none"> • Sinks • Transport carts
Materials and Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;"><i>Required</i>¹</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Balances, triple beam • Calculators • Cameras, disposable • Clocks • Collecting nets • Compasses, magnetic • Computers • Hand lenses • Hot plates • Magnets • Meter sticks • Microscopes, stereoscopic • Rulers, metric • Sound recorders • Thermometers, non-mercury 	<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;"><i>Recommended</i>²</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Aquarium with accessories • Egg incubators • Electric kits: knife-blade switch, lamp and base, electric bell, copper wire, nail • Beakers, plastic, graduated, 400 mL • Beakers, Pyrex, graduated <ul style="list-style-type: none"> 250 mL 600 mL • Burners, propane, or Bunsen burners • Conductometers • Cylinders, graduated, 100 mL • Eyedroppers • Iron filings • Lamps with aluminum reflector • Lenses, 2, convex • Mineral sets • Mirrors • Prisms • Rock sets: sedimentary, igneous, and metamorphic • Rubber hammers • Scissors • Terrarium • Thermometers, outdoor • Tuning forks

(table continues)

Table 1.6—Continued

Materials and Equipment	
Recommended²	
<p><u>Consumables</u></p> <ul style="list-style-type: none"> • Aluminum foil • Bags, plastic, with zipper seal • Baking soda • Batteries, dry cell, 6 volt • Beef bouillon cubes • Coal • Coffee cans with lids • Construction paper • Fertilizers • Glue, school • Ice • Paper, simple graphing • Pencils, colored • pH paper (vials) • Pots, plants • Potting soil • Salt • Solar tinting sheets for windows • Spoons, plastic • Sugar • Vinegar 	<p><u>Living/preserved specimens</u></p> <ul style="list-style-type: none"> • Animals and plants • Seeds, such as peas, corn and beans • Tree ring samples <p><u>Audiovisuals</u></p> <p><i>Models</i></p> <ul style="list-style-type: none"> • Geologic cross-cut diagram • Globe, Earth • Globe, lunar • Planetarium, hand-held <p><i>Charts</i></p> <ul style="list-style-type: none"> • Water cycle • Carbon cycle • Coal and oil formation • Life cycle of tree • Lunar phases • Nitrogen cycle • Tidal schedule <p><i>Videos</i></p> <ul style="list-style-type: none"> • Adaptive characteristics of organisms • Rain forest • Serengeti
<p>¹FYei]fYXlrc`gUFYgdVWUX]b`h YH9? G".....</p> <p>²FYWa a YbYX`]ggcZlrc`gk fY[YbYUHXVmiUbUm]b[`h YWbWdhH9? G"</p>	

Middle School Science Curriculum

Middle school students continue to learn and experience science through an integrated curriculum at each grade level. Science facilities must be flexible to support a curriculum that, within a single school year, requires students to conduct investigations in life science, earth/space science, and the physical sciences. As with elementary students, it is important for middle school students to be able to see the connection between what they learn in science classes and the science they experience outside the school setting.

The Texas Education Agency gives each school district the authority to establish the percentage of instructional time that middle school students spend doing hands-on laboratory and field investigations. NSTA recommends that middle school students spend 80 percent of their time in the science classroom doing these kinds of activities.

The following information represents a summary of the content requirements for middle school science and can serve as a guide to the types of facilities that are necessary in order for students to meet the state standards for science. The complete science TEKS are included in Appendix A.

Sixth Grade

Students use environmentally appropriate, ethical, and safe practices to conduct field and laboratory investigations. They use a variety of scientific methods and tools to collect and analyze data, record information, and make informed decisions using critical thinking and scientific problem-solving skills. They use computers and information technology to support their scientific investigations.

Students identify components of the solar system, including the Sun, planets, moon, and asteroids, and learn how seasons and the length of day are caused by the tilt and rotation of the Earth as it orbits the Sun. They investigate the rock cycle and identify sources of water in a watershed. In addition, students engage in activities to identify changes in objects—including their position, direction, and speed—when acted upon by a force.

Students classify substances according to their chemical properties and identify the water cycle and decay of a biomass as examples of the interactions that can occur between matter and energy. They identify life processes and the relationships between the structure and function of organisms.

Table 1.7
Sixth Grade Laboratory Materials and Safety Equipment

Safety Equipment	
<i>Required¹</i>	<i>Recommended²</i>
<ul style="list-style-type: none"> • Aprons • Eye/face washes • Fire blankets • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggles (splash-proof) • Safety goggle disinfecting materials or equipment 	<ul style="list-style-type: none"> • Sinks • Transport carts
Materials and Equipment	
<i>Required¹</i>	<i>Recommended²</i>
<p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Balances, triple beam • Beakers, plastic, graduated <ul style="list-style-type: none"> 100 mL 250 mL 400 mL • Calculators • Compasses, magnetic • Computer probes • Computers • Field equipment • Graduated cylinders, graduated <ul style="list-style-type: none"> 10 mL 100 mL • Hot plates • Magnets • Meter sticks • Microscopes • Petri dishes • Safety goggles • Spring scales • Telescopes • Test tubes • Thermometers, non-mercury • Timing devices • Weather instruments <ul style="list-style-type: none"> • outdoor thermometer • barometer • sling psychrometer 	<p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Aquarium with accessories • Electric generators • Electric fans • Eye droppers • Inclined planes with force mechanism • Insect collecting nets • Insect anesthetizing jars • Insect pins • Lamps with aluminum reflectors • Metric rulers • Microscope slides, blank • Microscope slides, depression • Microscope cover slips • Plant presses • Rock samples: sedimentary, igneous, and metamorphic • Scissors • Steam engines • Stirring rods • Terrarium with accessories • Test tube holders • Test tube racks • Thermometers, outdoor • Water filtering kits

(table continues)

Table 1.7—Continued

Materials and Equipment

Recommended²

Consumables

- Aluminum foil
- Bags, plastic, with zipper seal
- Brush, artist
- Clay, modeling
- Compost pile
- Construction paper
- Glue, school
- Herbarium paper
- Herbarium paste
- Kitchen chemicals
 - lemon juice
 - vinegar
 - baking soda
 - ammonia
 - liquid detergent
 - carbonated drink
 - tea
 - coffee
- pH paper or litmus paper
- Pans, aluminum pie
- Paper, simple graphing
- Pencils, colored
- Plant pots
- Potting soil
- Spoons (plastic)

Living/preserved specimens

- Mealworms, aquatic snails, or earthworms
- Plant seeds
- Microscope slides, prepared
 - muscle cells
 - blood cells
 - nerve cells
 - plant and animal
 - chromosomes, stained

Audiovisuals

Videos and CD-ROMs

- Mountain Building
- Volcanic activity
- Solar system: meteorites, comets, and asteroids
- Space travel

Game

- Food webs

Charts and transparencies

- Energy pyramid
- Rock cycle
- Atmospheric composition
- Clouds
- Composing
- Food pyramid
- Human organ systems
- Production of energy for human use
- Solar system

Models

- Animal cell
- Globe, Earth
- Human torso
- Lung
- Plant cell
- Planetarium showing tilt of Earth
- Planetarium, illuminated, hand-held

¹FYei]fYXlrc`gUFYgdVWUX]b`h`YH9? G'.....

²FYWa a YbXYX`]ggcZlrc`gk`fY[YbYUHXVmUUm]b[`h`YWbWdhH9? G'

Seventh Grade

Students use environmentally appropriate, ethical, and safe practices to conduct field and laboratory investigations. They use a variety of scientific methods and tools to collect and analyze data, record information, and make informed decisions using critical thinking and scientific problem-solving skills. They use computers and information technology to support their scientific investigations.

Students identify gravity and phases of the moon as components of the solar system and explore the effects on the Earth of events such as hurricanes. Students conduct activities using pulleys and levers to understand the relationship between force and motion and then relate that concept to processes found in the human organism. In addition, they investigate the chemical and physical properties of substances, and identify the physical properties of elements in order to understand their placement on the periodic table.

Students learn about kinetic and potential energy and identify photosynthesis as an example of the transformation of radiant energy to chemical energy. They investigate systems in humans to identify their structure and functions, and compare asexual and sexual reproduction to illustrate that genetic materials are responsible for dominant and recessive traits in organisms.

Eighth Grade

Students use environmentally appropriate, ethical, and safe practices to conduct field and laboratory investigations. They use scientific methods and tools to collect and analyze data, record information, and make informed decisions using critical thinking and scientific problem-solving skills. They use computers and information technology to support their scientific investigations.

Students investigate the ways in which the Earth's systems have been altered by human activities and natural events; learn about cycles within the Earth's systems by exploring lunar and rock cycles; and explore interactions in matter and energy found in solar, weather, and ocean systems.

Students learn that stars and galaxies are part of the universe, describe distance in terms of light years, and research scientific theories of the origin of the universe.

They examine information on the periodic table to learn how elements are grouped into families. In addition, students demonstrate exothermic and endothermic reactions.

Students participate in activities in which they predict results from different genetic combinations and explore the extinction of some species of organisms.

Table 1.8
Seventh Grade Laboratory Materials and Safety Equipment

Safety Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Required¹</div> <ul style="list-style-type: none"> • Aprons • Eye/face washes • Fire blankets • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggle disinfecting materials or equipment • Safety goggles, splash-proof 	<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <ul style="list-style-type: none"> • Sinks • Transport cart
Materials and Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Required¹</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Balances, triple beam • Beakers, plastic <ul style="list-style-type: none"> 100 mL 250 mL 400 mL • Calculators • Compasses, magnetic • Computer probes • Computers • Dissecting kits • Field equipment • Graduated cylinders <ul style="list-style-type: none"> 10 mL 100 mL • Hot plates • Magnets • Meter sticks • Microscopes, compound • Plant presses • Petri dishes • Spring scales, 10 N • Telescopes • Test tubes • Thermometers, non-mercury • Timing devices 	<ul style="list-style-type: none"> • Weather instruments <ul style="list-style-type: none"> • outdoor thermometer • barometer, • sling psychrometer • wind vane • rain gauge <div style="background-color: #cccccc; padding: 5px; margin-top: 10px;">Recommended²</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Aquarium with accessories • Anemometers • Bottles, thermos • Brushes, beaker • Carts, mechanical or dynamic • Dropping Bottles • Eyedroppers • Flasks, Erlenmeyer, 1000 mL • Herbarium paper • Herbarium paste • Insect nets • Insect anesthetizing jars • Insect pins • Lamps with aluminum reflector • Lever system kits (using meter sticks) • Metric rulers

(table continues)

Table 1.8—Continued

Materials and Equipment	
Recommended²	
<p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Microscope cover slips, plastic • Microscope slides • Microscope slides, depression • Pulley kits with suspension system • Respirometers • Stirring rods, glass • Stethoscopes • Stream table kits • Terrarium with accessories • Test tube holders • Test tube racks • Thermometers, oral, disposable sleeves • Tracks, potential and kinetic <p><u>Living/preserved specimens</u></p> <ul style="list-style-type: none"> • Fish and other animals • Paramecia and other protists • Seeds, bulbs, plant cuttings, rhizomes • Microscope slides, prepared <ul style="list-style-type: none"> • blood cells • sperm cells • cheek cells <p><u>Consumables</u></p> <p><i>Materials</i></p> <ul style="list-style-type: none"> • Bags, plastic, with zipper seal • Pots • Soil samples • Steel wool bundles • Wood splints <p><i>Chemicals</i></p> <ul style="list-style-type: none"> • Iron filings • Sulfur 	<p><u>Audiovisuals</u></p> <p><i>CD-ROM or Video</i></p> <ul style="list-style-type: none"> • Field guides: wildflowers, insects, etc. • Emergence of seeds • Flow of blood <p><i>Charts</i></p> <ul style="list-style-type: none"> • Asexual and sexual reproduction • Ecological succession • Human body system (digestive, circulatory) • Periodic Table of Elements • Photosynthesis • Renewable/non-renewable/inexhaustible energy • Solar system <p><i>Models</i></p> <ul style="list-style-type: none"> • Cell • Human skeleton • Human torso • Lung demonstration • Planetarium, hand-held
<p>¹FYei]fYXlrc`gUFYgdVJUYX]b`h YH9? G`.....</p> <p>²FYWa a YbYX`]ggcZlrc`gk fFY[YbYUHXVmiUbUm]b[`h YWbWdhH9? G`</p>	

Table 1.9
Eighth Grade Laboratory Materials and Safety Equipment

Safety Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;"><i>Required</i>¹</div> <ul style="list-style-type: none"> • Aprons • Eye/face washes • Fire blankets • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggles, splash-proof • Safety goggle disinfecting materials or equipment 	<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;"><i>Recommended</i>²</div> <ul style="list-style-type: none"> • Sinks • Transport carts
Materials and Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;"><i>Required</i>¹</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Balances, triple beam • Beakers <ul style="list-style-type: none"> 100 mL 250 mL 400 mL • Calculators • Computer probes • Computers • Dissecting kits • Field equipment • Graduated cylinders <ul style="list-style-type: none"> 10 mL 100 mL • Hot plates • Meter sticks • Microscopes, compound • Petri dishes • Spring scales, 10 N • Telescopes • Test tubes, 20 mL • Thermometers, non-mercury • Timing devices • Water test kits • Weather instruments 	<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;"><i>Recommended</i>²</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Anemometers • Aquarium and accessories • Astrolabes • Collision ball demonstrator • Eyedroppers • Flasks, 1000 mL • Herbarium paper • Herbarium paste • Inclined planes, Hall’s carriage, weight hangers and slotted weights • Insect anesthetizing jars • Insect nets • Insect pins • Lamps with aluminum reflector • Metric rulers • Microscope cover slips • Microscope slides • Microscope slides, depression • Plant presses • Rain gauge • Rock types sets • Sling psychrometers • Slinky and wave demonstration ropes • Static electricity kits • Stirring rods

(table continues)

Table 1.9—Continued

Materials and Equipment	
Recommended²	
<p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Stream table and accessories • Terrarium with accessories • Test tube holders • Test tube racks • Thermometers, oral, disposable sleeves • Thermometers, outdoor • Wind vanes <p><u>Living/preserved specimens</u></p> <ul style="list-style-type: none"> • Invertebrates, such as brine shrimp • Plants, various • Seeds with known genetic ratios <p><u>Consumables</u></p> <p><i>Materials</i></p> <ul style="list-style-type: none"> • Bags, plastic, with zipper seal • Potting soil <p><i>Chemicals</i></p> <ul style="list-style-type: none"> • Baking soda • Calcium chloride • Nitric acid, dilute • Phenol red • Sulfuric acid, dilute • Vinegar 	<p><u>Audiovisuals</u></p> <p><i>Documents</i></p> <ul style="list-style-type: none"> • Field guides <p><i>Charts</i></p> <ul style="list-style-type: none"> • Earth's climatic zones • Earth's prevailing winds • Lunar cycle • Nitrogen, carbon, and water cycles • Ocean currents • Periodic table of elements • Tides <p><i>Globe</i></p> <ul style="list-style-type: none"> • Earth <p><i>Map</i></p> <ul style="list-style-type: none"> • Northern Hemisphere
<p>¹FYei]fYXlrc`gUFYgdVJÚYX]b`h YH9? G`.....</p> <p>²FYWa a YbYX`]ggcZlrc`gk YFY[YbYUHXVmiUbUm]b[`h YWbWdhH9? G`</p>	

High School Science Curriculum

High school science courses beyond Integrated Physics and Chemistry concentrate less on integrated relationships among the science disciplines and more on a single discipline of science, although some integration is present. For example, Biology focuses on life science, but some of the essential knowledge and skills in the course require students to use chemistry, physics, and earth science.

School districts must support this discipline-focused curriculum by providing well-equipped laboratories where student-centered activities in biology, chemistry, physics, and the earth/space sciences can occur.

The Texas Administrative Code *tgswktgu* that at least 40 percent of the instructional time in all secondary science courses consist of laboratory and field work during which students apply appropriate scientific inquiry techniques.

The following information represents a summary of the content requirements for high school science courses and can serve as a guide to the types of facilities that are necessary in order for students to do the work required by the state curricular standards for science. The complete Science TEKS are included as Appendix A.

Integrated Physics and Chemistry

Students use safe, environmentally appropriate, and ethical practices to conduct field and laboratory investigations. They use a variety of scientific methods and make informed decisions using critical thinking and scientific problem-solving skills.

They investigate concepts of force and motion by exploring systems, Newton's laws, changes in force, and mechanical advantage and efficiency in simple machines. In addition, they demonstrate the effects of waves by investigating wave types and characteristics, wave interactions, uses of electromagnetic waves, and applications of acoustic principles.

Students explore the impact of energy transformations by investigating the movement of heat through solids, liquids, and gases, analyzing the efficiency of energy conversions, comparing the economic and environmental impacts of using energy, measuring conductivity in materials, comparing

parallel and series circuits, analyzing electric current and magnetic field in electromagnets, and analyzing effects of heating and cooling processes.

They understand the effects of changes in matter when engaged in activities that allow them to distinguish between physical and chemical changes, analyze energy changes in chemical reactions, analyze the economic and environmental impact of the end products of chemical reactions, investigate the law of conservation of mass, and describe types of nuclear reactions.

In addition, students investigate solution chemistry by exploring water as a universal solvent, relating the concentration of ions to a chemical's physical and chemical properties, simulating effects of acid rain, and demonstrating how various factors influence solubility and the rate at which substances dissolve.

Table 1.10
Integrated Physics and Chemistry Laboratory Materials and Safety Equipment

Safety Equipment			
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Required¹</div> <ul style="list-style-type: none"> • Aprons • Eye/face washes • Fire blankets • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggles, splash-proof • Safety goggle disinfecting materials or equipment 	<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <ul style="list-style-type: none"> • Sinks • Transport cart 		
Materials and Equipment			
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <table style="width: 100%; border: none;"> <tr> <td style="vertical-align: top; width: 50%; padding-right: 20px;"> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Alligator clips for electric circuits • Ammeters • Beakers <ul style="list-style-type: none"> 100 mL 250 mL 600 mL 1000 mL 2000 mL • Balances, triple beam • Balls and rings • Bimetallic strips • Bunsen burners with wing tips • Copper-insulated wire • Calculators, graphing • Clocks • Computers • Computer probes (light and sound, temperature, magnetic, and photogate) • Conductivity testers • Conductometers • Cork borer set and sharpener • Cylinders, graduated <ul style="list-style-type: none"> 10 mL 100 mL 1000 mL </td> <td style="vertical-align: top; width: 50%;"> <ul style="list-style-type: none"> • Density block sets • Dropping bottles • Dynamic carts • Eyedroppers • Flasks, Erlenmeyer <ul style="list-style-type: none"> 250 mL 1000 mL 2000 mL • Friction blocks • Friction pads, fur • Friction pads, silk • Friction pads, wool • Funnels, short-stem • Hall's Carriages • Hammers, rubber • Hot plates • Inclined planes with pulley attachment • Interference tubes • Knife blade switches • Lamps with aluminum reflectors • Lamps base and bulbs for circuits • Lever system kits (using meter sticks) • Magnets, pair of bar • Mass sets, hooked </td> </tr> </table>		<p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Alligator clips for electric circuits • Ammeters • Beakers <ul style="list-style-type: none"> 100 mL 250 mL 600 mL 1000 mL 2000 mL • Balances, triple beam • Balls and rings • Bimetallic strips • Bunsen burners with wing tips • Copper-insulated wire • Calculators, graphing • Clocks • Computers • Computer probes (light and sound, temperature, magnetic, and photogate) • Conductivity testers • Conductometers • Cork borer set and sharpener • Cylinders, graduated <ul style="list-style-type: none"> 10 mL 100 mL 1000 mL 	<ul style="list-style-type: none"> • Density block sets • Dropping bottles • Dynamic carts • Eyedroppers • Flasks, Erlenmeyer <ul style="list-style-type: none"> 250 mL 1000 mL 2000 mL • Friction blocks • Friction pads, fur • Friction pads, silk • Friction pads, wool • Funnels, short-stem • Hall's Carriages • Hammers, rubber • Hot plates • Inclined planes with pulley attachment • Interference tubes • Knife blade switches • Lamps with aluminum reflectors • Lamps base and bulbs for circuits • Lever system kits (using meter sticks) • Magnets, pair of bar • Mass sets, hooked
<p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Alligator clips for electric circuits • Ammeters • Beakers <ul style="list-style-type: none"> 100 mL 250 mL 600 mL 1000 mL 2000 mL • Balances, triple beam • Balls and rings • Bimetallic strips • Bunsen burners with wing tips • Copper-insulated wire • Calculators, graphing • Clocks • Computers • Computer probes (light and sound, temperature, magnetic, and photogate) • Conductivity testers • Conductometers • Cork borer set and sharpener • Cylinders, graduated <ul style="list-style-type: none"> 10 mL 100 mL 1000 mL 	<ul style="list-style-type: none"> • Density block sets • Dropping bottles • Dynamic carts • Eyedroppers • Flasks, Erlenmeyer <ul style="list-style-type: none"> 250 mL 1000 mL 2000 mL • Friction blocks • Friction pads, fur • Friction pads, silk • Friction pads, wool • Funnels, short-stem • Hall's Carriages • Hammers, rubber • Hot plates • Inclined planes with pulley attachment • Interference tubes • Knife blade switches • Lamps with aluminum reflectors • Lamps base and bulbs for circuits • Lever system kits (using meter sticks) • Magnets, pair of bar • Mass sets, hooked 		

(table continues)

Table 1.10—Continued

Materials and Equipment

Recommended²

Materials and equipment

- Meter sticks
- Metric rulers
- Mortars and pestles
- Optics kits
- Optics bench kits
- Overflow cans
- Pith balls, pair, coated in graphite and metal
- Polarized lens sets
- Power supplies (or dry cell battery)
- Prisms
- Protractors
- Pulley kits with suspension system
- Resonance apparatuses
- Ring stands with 4" ring
- Ripple tank generators for overhead projector
- Rods, glass
- Rods, rubber
- Scales, spring, 2.5 N capacity
- Scales, spring, 10 N capacity
- Samples: elements, compounds, and mixtures
- Sets of substances of varying densities
- Slinky springs
- Solar cells
- Spatulas
- Spectroscopes, quantitative analysis
- Steel spheres
- Stirring rods

- Stopwatches
- Stoppers, rubber and cork (assorted)
- Test tube holders
- Test tube racks
- Test tubes, 15 x 125 mm
- Test tubes, 20 x 150 mm
- Thermometers, metal back, alcohol
- Tongs, beaker
- Triangular files
- Tuning fork sets, various frequencies
- Tuning forks, same frequency
- Wash bottles, plastic
- Watch glasses
- Wave demonstration springs
- Voltmeters
- Wire screens, ceramic centered

Living/preserved specimens

- Microorganisms for acid rain investigation

Consumables

- Iron filings
- Litmus paper, vials
- pH paper, vials
- Salt for density solutions

Audiovisuals

- Periodic Table of Elements chart

¹FYei |fYXUbXfYWa a YbXYXgUZhmYei |da YbhUFYgdYVJUYX|b h Y`Uk ".....

²FYWa a YbXYX`|ggcZlcc`gk fFY| YbYUHXVmUUm|b| h YWbWdhH9? G"

Biology

Students use safe, environmentally appropriate, and ethical practices to conduct field and laboratory investigations. They use a variety of scientific methods and make informed decisions using critical thinking and scientific problem-solving skills.

They investigate cells as the basic structures of all living things and learn that cells have specialized parts that perform specific functions. They engage in activities to identify cell parts and cellular processes, understand the differences in structure and function between living cells and viruses, and explore the role of bacteria in maintaining health.

Students conduct investigations to discover how organisms grow and how specialized cells, tissues, and organs develop. They compare cells from plants and animals, identify cell differentiation, and sequence levels of organization in multicellular organisms.

In addition, they learn about the structures and functions of nucleic acids in the mechanisms of genetics. They also learn about the theory of biological evolution by identifying changes in species' DNA and examining other evidence.

Students practice taxonomy by collecting and classifying organisms, analyzing relationships among organisms, and identifying characteristics of a hierarchical classification system.

Investigations conducted by students further their understanding of metabolic processes and energy transfers that occur in living organisms, as they explore the structures and functions of biomolecules, compare photosynthesis to respiration, identify the effects of enzymes on food, and analyze matter and energy at different trophic levels.

Further investigations engage students with an understanding that living systems are found within other living systems, organisms maintain homeostasis, and interdependence and interactions occur within an ecosystem.

Chemistry

Students use safe, environmentally appropriate, and ethical practices to conduct field and laboratory investigations. They use a variety of scientific methods and make informed decisions using critical thinking and scientific problem-solving skills.

They investigate physical and chemical properties and determine compressibility, structure, motion of particles, shape, and volume of solids, liquids, and gases. Students investigate mixtures and pure substances and use the periodic table to describe an element's physical and chemical characteristics.

Students conduct investigations to observe energy transformations that occur during physical and chemical changes in matter. They engage in activities to identify changes in matter, and measure energy transformations and the influence of heat energy on the properties of liquids, solids, and gases.

In addition, they explore atomic structure as determined by nuclear composition, allowable electron cloud, and subatomic particles, as well as variables that influence the behavior of gases. Students participate in activities that help them understand how atoms form bonds to acquire a stable arrangement of electrons.

They actively engage in activities to demonstrate common oxidation reactions, use balanced chemical equations to interpret and describe interactions of matter, and investigate factors that influence the solubility of solutes in a solvent.

Students conduct investigations to understand the relationships among the concentration, electrical conductivity, and colligative properties of solutions, as well as the properties of acids and bases; and they discover the factors involved in chemical reactions.

Table 1.11
Biology Laboratory Materials and Safety Equipment

Safety Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Required¹</div> <ul style="list-style-type: none"> • Aprons • Eye/face washes • Fire blankets • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggles, splash-proof • Safety goggle disinfecting materials or equipment 	<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <ul style="list-style-type: none"> • Transport carts • Sinks
Materials and Equipment	
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Aquarium with accessories • Autoclaves • Balances, triple beam • Beakers, Pyrex <ul style="list-style-type: none"> 100 mL 250 mL 400 mL 600 mL 1000 mL 2000 mL • Bird feeders • Bunsen burners • Brushes, flask • Brushes, beaker • Calculators, graphing • Clamps, pinch • Clocks with second hand • Computer probes • Computers, resident • Cork borer sets and sharpeners • Cylinders, graduated <ul style="list-style-type: none"> 10 mL 100 mL 500 mL • Dichotomous keys • Dishes, culture • Dissecting kits 	<ul style="list-style-type: none"> • Dissecting pans • Dropping bottles, 10 mL • Eyedroppers • Files, triangular • Flasks, Erlenmeyer <ul style="list-style-type: none"> 125 mL 250 mL 500 mL 1000 mL 2000 mL • Funnels, short-stem • Herbarium labels • Herbarium paper • Herbarium paste • Hot plates • Incubators for eggs • Incubator ovens • Inoculating loops • Insect anesthetizing jars • Insect nets • Insect pins • Lenses, hand • Meter sticks • Metric rulers • Microscopes, compound and stereo • Microscope cover slips, plastic • Microscope slides • Microscope slides, depression • Mortars and pestles

(table continues)

Table 1.11—Continued

Materials and Equipment	
Recommended²	
<u>Materials and equipment</u>	
<ul style="list-style-type: none"> • Pens, wax, marking • Petri dishes • Pipets, graduated <ul style="list-style-type: none"> 1 mL 5 mL 10 mL • Plant presses • Pots, planting, plastic • Ring stands • Ring stand clamps • Spatulas, 4", stainless steel • Sphygmomanometers • Stethoscopes • Stirrers, magnetic • Stirring rods, glass • Stoppers, rubber, assorted • Survey collections, animals • Survey collections, plants • Terrarium with accessories • Test tube baskets • Test tube brushes, regular • Test tube brushes, small • Test tube holders • Test tubes, Pyrex, 20 x 150 mm • Test tubes, Pyrex, 10 x 75 mm • Test tube racks • Thermometers, oral, disposable sleeves • Thermometers, alcohol 10° –110° C • Tongs, beaker • Trays, dissecting • Tubing, dialysis 	<ul style="list-style-type: none"> • Protist cultures • Seeds for DNA studies • Slides, prepared <ul style="list-style-type: none"> • animal cells and tissues • plant cells and tissues • Yeast suspension
	<u>Consumables</u>
	<ul style="list-style-type: none"> • Agar plates, starch • Cotton swabs • Food coloring • Food products • Kidney, fresh • Lamp with reflector • Milk • Nitrogen fertilizer • Scissors • Starch
	<u>Audiovisuals</u>
	<i>CD-ROMs and videos</i>
	<ul style="list-style-type: none"> • Cell structure and function • Classification • Evolution processes • Body systems • Meiosis • Mitosis • Plant anatomy and physiology • Photosynthesis • Planting flats, plastic
	<i>Charts</i>
	<ul style="list-style-type: none"> • Bacteria • Human body systems • Prokaryotic and eukaryotic cells • Viruses • Cycles (carbon, oxygen, nitrogen, and water)
	<i>Models</i>
	<ul style="list-style-type: none"> • DNA structure and protein synthesis activity kits • Human torso • Meiosis • Mitosis • Variation and evolution kits
<u>Living/preserved specimens</u>	
<ul style="list-style-type: none"> • Aquatic plants, <i>Elodea</i> • Brine shrimp • Cultures <ul style="list-style-type: none"> • <i>Bacillus cereus</i> • <i>Bacillus subtilis</i> • <i>Escherichia coli</i> 	
<p>¹FYei]fYXUbXfYWa a YbYXgUZImYei]da YbhUFYgIYMUYX]b h Y`Uk "....."</p> <p>²FYWa a YbYX`]g`cZlcc`gk YfY[YbYfUHXVmiUbUmm]b[`h YWbWdhH9? G"</p>	

Table 1.12
Chemistry Laboratory Materials and Safety Equipment

Safety Equipment					
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Required¹</div> <ul style="list-style-type: none"> • Aprons • Eye/face washes • Fire blankets • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggles, splash-proof • Safety goggle disinfecting materials or equipment 	<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <ul style="list-style-type: none"> • Sinks • Transport carts 				
Materials and Equipment					
<div style="background-color: #cccccc; padding: 5px; margin-bottom: 10px;">Recommended²</div> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black; padding-bottom: 5px;"><u>Materials and equipment</u></th> <th></th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top; padding: 5px;"> <ul style="list-style-type: none"> • Balances, electronic • Barometers • Beakers, graduated <ul style="list-style-type: none"> • 100 mL • 250 mL • 400 mL • 600 mL • 1000 mL • Bottles, dropper, 10 mL • Bottles, dropper, 30 mL • Burets, 50 mL • Burners, Bunsen or Tirrill • Calculators, graphing • Calorimeters • Centrifuges • Ceramic squares • Clamps <ul style="list-style-type: none"> • test tube • 3-prong jaw • buret, double • pinch • utility • Clocks • Cobalt-blue glass • Computers </td> <td style="vertical-align: top; padding: 5px;"> <ul style="list-style-type: none"> • Computer probes <ul style="list-style-type: none"> • temperature • pH • barometric pressure • Geiger Miller tube • Condensers • Conductivity apparatuses • Condensers • Cork borers • Crucibles • Crucible covers • Cups, plastic foam, 16 oz. • Cylinders, graduated <ul style="list-style-type: none"> • 10 mL • 50 mL • 100 mL • 1000 mL • Cutters, metal • DC sources, 0–12 v., 5 amp with leads • Desiccators • Droppers, medicine • Droppers, pipet • Drying ovens • Electrolysis apparatuses • Evaporating dishes </td> </tr> </tbody> </table>		<u>Materials and equipment</u>		<ul style="list-style-type: none"> • Balances, electronic • Barometers • Beakers, graduated <ul style="list-style-type: none"> • 100 mL • 250 mL • 400 mL • 600 mL • 1000 mL • Bottles, dropper, 10 mL • Bottles, dropper, 30 mL • Burets, 50 mL • Burners, Bunsen or Tirrill • Calculators, graphing • Calorimeters • Centrifuges • Ceramic squares • Clamps <ul style="list-style-type: none"> • test tube • 3-prong jaw • buret, double • pinch • utility • Clocks • Cobalt-blue glass • Computers 	<ul style="list-style-type: none"> • Computer probes <ul style="list-style-type: none"> • temperature • pH • barometric pressure • Geiger Miller tube • Condensers • Conductivity apparatuses • Condensers • Cork borers • Crucibles • Crucible covers • Cups, plastic foam, 16 oz. • Cylinders, graduated <ul style="list-style-type: none"> • 10 mL • 50 mL • 100 mL • 1000 mL • Cutters, metal • DC sources, 0–12 v., 5 amp with leads • Desiccators • Droppers, medicine • Droppers, pipet • Drying ovens • Electrolysis apparatuses • Evaporating dishes
<u>Materials and equipment</u>					
<ul style="list-style-type: none"> • Balances, electronic • Barometers • Beakers, graduated <ul style="list-style-type: none"> • 100 mL • 250 mL • 400 mL • 600 mL • 1000 mL • Bottles, dropper, 10 mL • Bottles, dropper, 30 mL • Burets, 50 mL • Burners, Bunsen or Tirrill • Calculators, graphing • Calorimeters • Centrifuges • Ceramic squares • Clamps <ul style="list-style-type: none"> • test tube • 3-prong jaw • buret, double • pinch • utility • Clocks • Cobalt-blue glass • Computers 	<ul style="list-style-type: none"> • Computer probes <ul style="list-style-type: none"> • temperature • pH • barometric pressure • Geiger Miller tube • Condensers • Conductivity apparatuses • Condensers • Cork borers • Crucibles • Crucible covers • Cups, plastic foam, 16 oz. • Cylinders, graduated <ul style="list-style-type: none"> • 10 mL • 50 mL • 100 mL • 1000 mL • Cutters, metal • DC sources, 0–12 v., 5 amp with leads • Desiccators • Droppers, medicine • Droppers, pipet • Drying ovens • Electrolysis apparatuses • Evaporating dishes 				

(table continues)

Table 1.12—Continued

Materials and Equipment	
<p style="background-color: #cccccc; padding: 2px; margin: 0;"><i>Recommended²</i></p> <p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Files, triangular • Flasks, distilling, 250 mL • Flasks, filter, 500 mL • Flasks, volumetric <ul style="list-style-type: none"> 100 mL 1000 mL 250 mL 500 mL • Flasks, Erlenmeyer <ul style="list-style-type: none"> 100 mL 1000 mL 250 mL 500 mL • Funnels, long-stem • Funnels, short-stem • Geiger counters • Hot plates • Lighters, burner • Magnetic stirrers • Meter sticks • Molecular model sets • Mortars and pestles • pH meters, handheld • Pencils, glass marking • Pipets, graduated, glass <ul style="list-style-type: none"> 1 mL 5 mL 10 mL • Ring supports with clamps: 2" and 4" • Ring stands, 20" • Ring stand screens • Rubber bands, small • Rubber policemen • Rubber suction bulbs • Rulers, metric • Spatulas/scopulas • Spectrophotometers • Spectroscopes • Spectrum tubes 	<ul style="list-style-type: none"> • Spectrum tube power supplies • Spot plates • Stirring rods, glass • Stoppers, cork, assorted • Stoppers, rubber, 1-hole and 2-hole, assorted • Stoppers, rubber, solid, assorted • Test tube holders • Test tube racks • Test tubes, large • Test tubes, medium • Test tubes, small • Thermometers, -20 to 150° C • Thermometers, electronic • Tongs, crucible • Tongs, beaker • Triangles, 1 1/2", clay-covered • Tubing, plastic, connecting • Tubing, rubber, connecting • Tubing, capillary, glass, melting point • Tubing, glass, assorted • Tubing, rubber, 1/4" ID • Tweezers or forceps • Wash bottles, plastic • Watch glasses • Weighing bottles • Wire gauze, ceramic centers, 5" x 5" • Wire, nichrome or platinum <p><u>Consumables</u></p> <ul style="list-style-type: none"> • Litmus, red & blue vials • Paper, chromatography • Paper, filter, assorted sizes • Paper, pH, vials • Parafilm, roll <p><u>Audiovisuals</u></p> <p style="padding-left: 20px;"><i>Charts</i></p> <ul style="list-style-type: none"> • Common ions • Oxidation-reduction potential • Periodic table of elements • Spectrum
<div style="border: 1px solid black; padding: 5px; margin: 0 auto; width: 80%;"> <p>¹FYei]fYX'UbX'fYWa a YbXX'gUZImYei]da YbhUFYgdYU'YX']b h Y'Uk "....."</p> <p>²FYWa a YbXX'`]g'cZlrc`gk YFY[YbYFUHX'VmiUbUm]b['h YWbWdhH9? G"</p> </div>	

Physics

Students use safe, environmentally appropriate, and ethical practices to conduct field and laboratory investigations. They use scientific methods and make informed decisions using critical thinking and scientific problem-solving skills.

They investigate the laws governing motion by analyzing uniform and accelerated motion, exploring the effects of forces on motion, and developing free-body diagrams for force analysis.

Students conduct investigations in which they explore changes that occur within a physical system, observe kinetic and potential energy, and learn the influence of mass and distance on gravitational forces.

They actively engage in activities in which they learn about the laws of thermodynamics; they examine the characteristics and behavior of waves by propagating waves in various types of media; and they describe simple examples of quantum physics by explaining the line spectra from gas-discharging tubes.

Chapter 112 of the Texas Administrative Code

Advanced High School Courses

identifies additional courses for school districts to consider when developing a well-balanced science program. These include Environmental Systems, Aquatic Science, Astronomy, and Geology, Meteorology, and Oceanography.

In addition, Advanced Placement® (AP) and the International Baccalaureate® (IB) courses should be available to challenge students. In both AP and IB courses, specific laboratory investigations are strongly recommended for students prior to their taking end-of-course examinations.

<u>AP COURSES</u>	<u>IB COURSES</u>
<ul style="list-style-type: none">• Biology• Chemistry• Physics• Environmental Science	<ul style="list-style-type: none">• Biology• Chemistry• Physics• Environmental Systems

Other High Schools Courses for Science Credit

The Texas Administrative Code, Chapter 121 (Health Science Technology Education) and Chapter 123 (Technology Education/Industrial Technology Education) identify additional courses for which students may receive high school science credits. These courses require that at least 40 percent of the instructional time consist of laboratory and field investigations during which students apply appropriate scientific inquiry methods. Therefore, school districts must provide well-designed and well-equipped facilities in order for students to meet the requirements of these courses.

HEALTH SCIENCE TECHNOLOGY EDUCATION	TECHNOLOGY EDUCATION AND INDUSTRIAL TECHNOLOGY EDUCATION
Scientific Research and Design Anatomy and Physiology of Human Systems Medical Microbiology Pathophysiology	Principles of Technology I Principles of Technology II

Table 1.13
Physics Laboratory Materials and Safety Equipment

Safety Equipment	
Required¹	Recommended²
<ul style="list-style-type: none"> • Aprons • Eye/face washes • Fire blankets • Fire extinguishers • First-aid kits • Material Safety Data Sheets • Safety goggles, splash-proof • Safetygoggle disinfecting materials or equipment 	<ul style="list-style-type: none"> • Sinks • Transport carts
Materials and Equipment	
Recommended²	
<p><u>Materials and equipment</u></p> <ul style="list-style-type: none"> • Ammeters, triple range • Balances, triple beam • Balls and rings • Beakers, Pyrex, 400 mL • Beakers, Pyrex, 600 mL • Bimetallic strips • Bunsen Burners • Calculators, graphing • Calipers, micrometer • Calipers, vernier • Calorimeters • Carts, dynamics set • Cathode ray tubes, sealed, with screen • Clamps (4") • Clocks • Cloud chambers • Collision apparatuses, two dimensions • Compasses, magnetic • Computer probes tube <ul style="list-style-type: none"> • sound • magnetic • light • photogate • temperature • pendulum • Geiger Miller • Computers • Conservation of momentum apparatus 	<ul style="list-style-type: none"> • Coulomb's Law apparatus • Cylinders, graduated <ul style="list-style-type: none"> 10 mL 50 mL 500 mL 1000 mL • Discharge tubes, vacuum • Eyedroppers • Friction blocks with hooks • Friction pads, fur • Friction pads, silk • Friction pads, wool • Electroscopes, measuring • Galvanometers, center zero • Hall's Carriages • Hammers, rubber • Hot plates • Inclined planes • Induction coils • Lab masses, set, brass • Lab masses, set, hooked • Lamps with aluminum reflectors • Light sources, intense, for ripple tank • Magnets, bar • Magnets, strong, bar, pair • Magnets, strong, horseshoe • Masses, small, known specific heat, metal,

(table continues)

Table 1.13—Continued

Materials and Equipment

Recommended²

Materials and equipment

- Masses, unknown specific heat, metal, small
- Meter sticks
- Nails, large iron
- Nylon thread
- Optical bench sets
- Optics kits
- Pendulum bobs
- Pendulum supports
- Pith balls pair, graphite or metal coated
- Polarized lenses
- Power supplies: AC, DC
- Prisms
- Protractors
- Pulleys with clamp for table edge
- Recorder timers
- Resistors, 5–10 watts
 - 5 ohms power rating
 - 10 ohms power rating
 - 15 ohms power rating
 - 30 ohms power rating
- Resonance tubes, 50 cm
- Ring clamps
- Ring stands
- Ring stand screens
- Rings, 4"
- Ripple tank assemblies, complete
- Ripple tank wave generators
- Rods, rubber
- Rods, glass
- Rulers, metric
- Scales, spring
 - 2.5 N
 - 10 N
 - 20 N
- Screwdrivers
- Slinkies

- Slotted weight sets
- Stopwatches
- Stroboscopes
- Switches, knife-blade
- Tagboards
- Thermometers, -2°–110° C, alcohol
- Trajectory apparatuses
- Tuning for sets, 256 Hertz and above
- Voltmeters, triple range: 0–1.5, 3, 30A
- Wave motion rope
- Weight hangers
- Wire, copper, insulated, 18 gauge

Consumables

- Carbon paper
- Dry ice
- Iron filings
- Paper clips
- Paper, white, craft
- Recorder timer carbon discs
- Recorder timer tapes
- Sheets of cardboard
- Tracing paper
- Twine, heavy cotton
- Wax

Audiovisuals

CD-ROM

- Laws of thermodynamics
- Photoelectric effect
- Role of electromagnetic spectrum

Charts

- Electromagnetic spectrum
- Periodic table of elements

Other

- J cpfdqqm"ql"Rj{ukecn"Eqpuwcpvu

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²FYWa a YbXYX`]ggcZlcc`gk fY[YbYUHX'VmUUm]b['h YWbWdhH9? G'

School Facilities Standards

The state commissioner of education has established rules concerning the standards for school facilities in Chapter 61.1033 of the Texas Administrative Code, School Facilities Standards. These rules provide definitions and procedures, dates by which school facilities must be compliant, certification of design and construction, minimum square foot requirements, educational adequacy, and construction quality of facilities within school districts in Texas (Appendix A).

Renovations and New Construction

Renovations may vary from redesigning a single science laboratory room to remodeling furniture, cabinets, fixtures, electrical systems, plumbing, and mechanical systems in an entire science wing. Some extensive renovations are classified as *major space renovations*, in which case the school district must comply with the current rules and regulations for new construction.

Major Space Renovation

The School Facilities Standards define construction projects as major space renovations when at least 50 percent of the gross area of a facility's instructional space is within the limits of the work. For example, if the science area of a school consists of 10 classrooms and 5 laboratory rooms, and at least 50 percent of the total area containing the rooms is being renovated, the construction project is classified as a major space renovation.

Effective Date

New construction projects and major space renovations that were approved by a local school board of trustees after September 1, 1998 must comply with the regulations set forth in School Facilities Standards.

The Commissioner's Rules Concerning School Facilities, Chapter 6, Subchapter CC are being revised. These new rules, concerning new construction and renovations, will replace the current rules discussed in this chapter.

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New construction or major space renovations must be certified by the architect or engineer to assure the school district that

- the architect or engineer has reviewed the School Facilities Standards and used his/her best professional judgment and care consistent with the practice of architecture or engineering in the state of Texas in executing construction documents; and
- the certification documents conform to the provisions of the School Facilities Standards, except where indicated.

A copy of the Certification Compliance Form, required of the architect or engineer as specified under the Texas Administrative Code Chapter 61.1033(c)(3)(A)-(C), can be found in Appendix A.

Certification must include the following provisions:

- The school district must notify and obligate the architect or engineer to provide the required certification.
- The architect's or engineer's signature and seal must appear on the construction documents to certify compliance.
- The school district must provide the architect or engineer with the long-range school facility plan and/or the educational specifications and building code specifications for the facility.

- The architect or engineer must perform a building code search under applicable regulations and must certify that the design has been researched before finalizing it.
- The architect or engineer must certify that the facility has been designed according to the provisions in the School Facilities Standards, based on the long-range facility plan and/or educational specifications, building codes, and documented changes to the construction documents provided by the district.
- The building contractor or construction manager must certify that the facility has been constructed in accordance with the construction documents.
- When the construction is complete, the school district must certify that the facility conforms to the design requirements specified by the long-range plan and/or education specifications and building code specifications.

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A school district must provide instructional space for students that meets the district's educational specifications based on the requirements of educational adequacy. These requirements state that a proposed new school facility or a major space renovation of an existing school facility must be designed according to the requirements of the school district's educational program and the student population that it serves.

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A school district may satisfy educational adequacy requirements by using either the standard for minimum square feet per pupil or the standard for square feet per room. Room size requirements are based on rooms that will house 22 students at the elementary level and 25 students at the middle and high school levels.

Uswctg"hggy"rgt"rwrkn is calculated by dividing the net interior space of a room by the maximum number of students to be housed in the room.

Uswctg"hggy"rgt"tqqo is the net square footage of the room that will house the students. The net square footage of a room may include exposed storage space (cabinets and shelves) but does not include hallway space or storage space, such as closets and preparation rooms, that may be connected to the room.

The School Facilities Standards regulate space and minimum square foot requirements for science classrooms and lecture/laboratory combination rooms. There are no space or minimum square foot requirements for a standard science laboratory.

Science Classrooms

According to the definitions used to calculate the required space for students, science classrooms and lecture/laboratory rooms built after September 1, 1998 must meet the following requirements.

General Classrooms

- Prekindergarten–Grade 1 classrooms must provide a minimum of 36 square feet per pupil or 800 square feet per room.
- Elementary school rooms must provide a minimum of 30 square feet per pupil or 700 square feet per room.
- Secondary school rooms must provide a minimum of 28 square feet per pupil or 700 square feet per room.

According to these requirements, a school district may build new science classrooms for a middle school at 700 square feet per classroom, assuming that the average class load does not exceed 25 students.

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If the average student load for a science classroom exceeds 25, the school district should increase the square footage of the room based on the increase above 25 for the average student per period. The minimum size of the room must not be less than 700 square feet.

If the average class load for a middle school science class is 32 students per period, the square footage should increase by 196 square feet to accommodate the increase in the number of students.

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However, school districts may choose to use the square feet per room standard; although the room must accommodate 32 students, the district may choose to build to the minimum standard of 700 square feet.

The Texas Education Agency recommends that *no more than two science classrooms share a single laboratory*. The mandated time requirements for high school—40 percent laboratory and field investigations—cannot be met if more than two science teachers share laboratory facilities. Similarly, elementary and middle school teachers cannot adequately provide laboratory experiences when more than two teacher share a laboratory room.

Science Lecture/Laboratory Rooms

A lecture/laboratory room may be defined as a science room that is designed to support both standard classroom activities and laboratory investigations. It should be equipped with student stations and access to electricity, water, and natural gas.

In addition, features found in a standard science laboratory room should be present. A separate area used as a standard classroom must be contained in the same room. For examples of lecture/laboratory rooms and other science facility designs, please refer to Chapter Three.

Lecture/laboratory rooms must meet the following minimum space requirements.

- Elementary school lecture/laboratory rooms must provide a minimum of 41 square feet per pupil or 900 square feet per room.
- Middle school lecture/laboratory rooms must provide a minimum of 50 square feet per pupil or 1,000 square feet per room.
- High school lecture/laboratory rooms must provide a minimum of 50 square feet per pupil or 1,200 square feet per room.

Science Laboratory Rooms

The School Facilities Standards do not address a stand-alone science laboratory room. The National Science Teachers Association (NSTA) makes the following recommendations for science laboratory minimum size that schools involved in construction or renovation projects may use as guidelines (Table 1.14).

Table 1.14

GRADE LEVEL	NUMBER OF STUDENTS	SQUARE FEET/ROOM	SQUARE FEET/PUPIL
K–GRADE 5	24	1,000	40
GRADES 6–8	24	1,125	45
GRADES 9–12	24	1,250	50

Overcrowding and Science Facilities

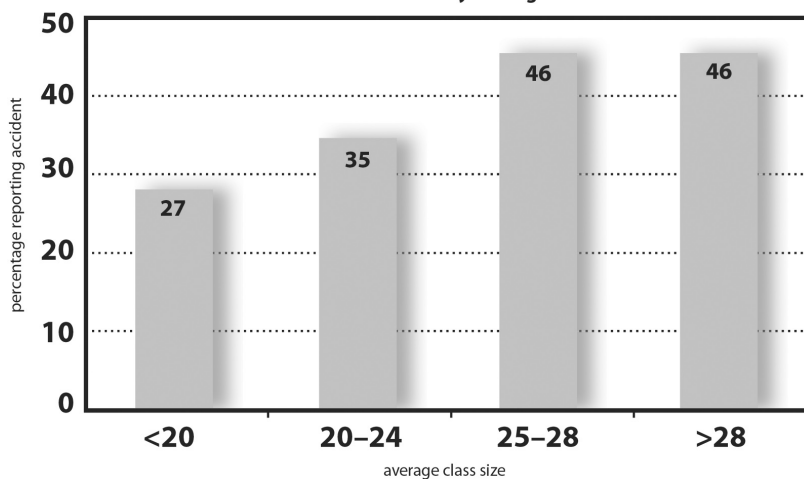
School districts in Texas are experiencing rapid increases in student enrollment that fill science classrooms and laboratories beyond the recommended capacities. School districts may only have building funds to accommodate existing student populations and may not include plans for future growth.

Schools should be aware of the dilemma that teachers confront when meeting the required Texas Essential Knowledge and Skills. Teachers are required by law to conduct laboratory and field experiences with their students while maintaining a safe learning environment in laboratories and classrooms. However, these two rooms may not provide enough workstations for the students they are assigned to teach.

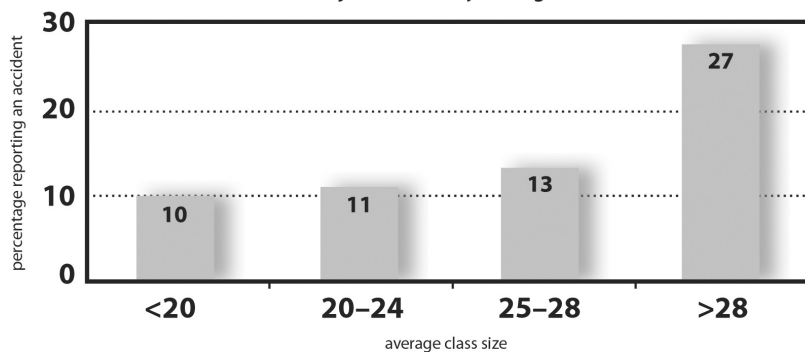
Research has confirmed that overcrowded conditions adversely affect the safety of students and teachers. Results reported in the Charles A. Dana Center's *Analysis of Laboratory Safety in Texas* confirm that minor accidents (Graph 1) and major accidents (Graph 2) are more likely to occur in schools with an average student/class ratio greater than 24. The report defined a major accident as one in which medical attention is required.

School administrators, therefore, should not be forced to decide whether to direct science teachers to ignore state requirements and not require laboratory instruction, follow the TEKS and permit their teachers to work in unsafe conditions, or reduce class loads for science teachers.

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



Graph 2: Percentage of respondents reporting the occurrence of a major accident by average class size



Construction Quality

A school district must comply with local building codes, including meeting fire and mechanical, electrical, and plumbing standards.

A district located in an area that has not adopted local building codes must adopt and use the latest edition of either the Uniform Building Code, the Standard (Southern) Building Code, or the International Building Code and related fire and mechanical, electrical, and plumbing codes, as well as the National Electric Code.

School districts must also comply with the provisions of the Americans with Disabilities Act of 1990 and other local, state (including the Texas Accessibility Standards), and federal requirements, where applicable.

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) prohibits discrimination on the basis of disability in employment, state and local government, public accommodations, commercial facilities, transportation, and telecommunications.

To be protected by the ADA, a person must have a disability or a relationship or association with an individual who has a disability. An individual with a disability is a person who has a physical or mental impairment that limits one or more major life activities; a person who has a history or record of impairment; or a person who is perceived by others as having such an impairment.

Architectural Barriers Act

The Architectural Barriers Act (ABA) requires that buildings and facilities designed, constructed, or altered with federal funds or leased by a federal agency comply with federal standards for physical accessibility. ABA requirements are limited to architectural standards in new and altered buildings and in newly leased facilities. They do not address the activities conducted in those buildings and facilities.

Individuals with Disabilities Education Act

The Individuals with Disabilities Education Act (IDEA) requires public schools to make available to all eligible children with disabilities a free and appropriate education in the least restrictive environment possible and appropriate to their individual needs.

Texas Accessibility Standards

The Texas Accessibility Standards establish regulations for accessibility by individuals with disabilities to public buildings and facilities; privately owned buildings or facilities leased or occupied by state agencies; places of public accommodation; and commercial facilities (Appendix A).

These standards should be considered the minimum requirements for all spaces and elements of building and facilities constructed after April 1, 1994. They further the equal treatment of people with disabilities to the maximum extent possible and reasonable.

Reference Guide to Safety and Science Facilities

The following reference guide summarizes laws, rules, regulations and recommendations that school districts should follow when designing science facilities and selecting safety equipment for their science programs. A complete version of the reference can be found in Appendix A.

Table 1.15

CONTEXT	REFERENCE	STATUS
Science must be taught in kindergarten–grade 12	19TAC§28. Subchapter A, Section 28.001	required
Science Essential Knowledge and Skills (TEKS), kindergarten–grade 12	19TAC§112. Subchapters (A–C)	required
Square foot per classroom and lecture/laboratory room	19TAC. Part II, §61. Subchapter CC, Section 61.1033	required
Square foot standards for science laboratories	Texas Education Agency, National Science Teachers Association	recommended
Certificate of Compliance for architects, engineers, and contractors	19TAC§61. Section 61.033(c)(3)(A–C)	required
Forty percent laboratory/field instruction in grades 9–12 science courses	19TAC. Part II, §74. Subchapter A, Section 74.3	required
Laboratory/field instruction required in science classes, grades 1–8	19TAC§112. Subchapters (A–C)	required
Inclusion of students with disabilities in science laboratory instruction	Public Law 105–17 Title I, Section 101, Part A	required
Access to science facilities for students and teachers with disabilities	Texas Accessibility Standards Architectural Barriers Act, Article 9102	required

(table continues)

Table 1.15—Continued

CONTEXT	REFERENCE	STATUS
Districts must provide free and appropriate education in the least restrictive environment possible.	Individuals with Disabilities Education Act (IDEA)	required
Districts must provide personal protective equipment, such as: <ul style="list-style-type: none"> • fume hoods • ventilation systems • eyewashes • safety showers • fire blankets 	Texas Hazard Communications Act 5TAC. Subtitle D, Chapter 502 Subchapter A, Section 502.001	required
Standards for safety equipment safety showers eyewashes drench hoses	ANSI Z358.1 ANSI Z358.1 ANSI Z351.1	recommended
Standards for eye protection devices	25TAC. Part I, Chapter 195, Subchapter F	required
Protection of students from conditions detrimental to learning, physical health, mental health, and safety	19TAC. Part 7, Chapter 247	required
Districts provide eye safety goggles; students and teachers must wear them.	TEC. Chapter 38, Section 38.005	required
Fire extinguishers in laboratory rooms	28TAC. Chapter 34, Sections 34.501-34.523	required
Flammables and corrosives cabinets	National Fire Protection Agency (NFPA)	recommended
Two exits in rooms of 1000 square feet or larger	NFPA 45, Life Safety Code 101	required if adopted locally
Guidelines for maintaining the quality of air in public schools	Voluntary Indoor Air Quality Guidelines, 5TAC, Chapter 297	recommended

