

Convection: A Current Event

Grades 6-7-8-9

National Science Education Standards

SCIENCE AS INQUIRY STANDARDS

LEVELS 5-8	LEVELS 9-12
Abilities necessary to do scientific inquiry	Abilities necessary to do scientific inquiry
Understanding about scientific inquiry	Understanding about scientific inquiry

PHYSICAL SCIENCE STANDARDS

LEVELS 5-8	LEVELS 9-12
Properties and changes of properties in matter	Structure and properties of matter
Motion and forces	Motions and forces
Transfer of energy	Conservation of energy and increase in disorder
	Interactions of energy and matter

EARTH AND SPACE SCIENCE STANDARDS

LEVELS 5-8	LEVELS 9-12
Structure of the earth system	Energy in the earth system
Earth's history	Geochemical cycles
	Origin and evolution of the earth system

Texas Essential Knowledge and Skills

Grade 6 Science

(a) Introduction.

- (1) In Grade 6, the study of science includes conducting laboratory investigations and fieldwork using scientific methods, analyzing information, making informed decisions, and using tools such as beakers, test tubes and spring scales to collect, analyze, and record information.
- (2) As students learn science skills, they identify components of the solar system including the sun, planets, moon, an asteroids and learn how seasons and the length of the day are caused by the tilt an rotation of the Earth as it orbits the sun. Students investigate the rock cycle and identify sources of water in a watershed.
- (3) In addition, Grade 6 students identify changes in objects including position, direction, and speed when acted upon by a force. Students classify substances by their chemical properties and identify the water cycle ad decay of biomass as examples of the interactions between matter and energy.

- (4) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and also should know that science may not answer all questions.
 - (5) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.
 - (6) Investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and that methods, models, and conclusions build from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the physical world.
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(b) Knowledge and skills

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| (1) Scientific processes. The student conduct laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices. | The student is expected to:
(A) demonstrate safe practices during laboratory investigations and fieldwork; and
(B) make wise choices in the use and conservation of resources and the disposal of materials. |
| (2) Scientific processes. The student uses scientific methods during fieldwork and laboratory investigations. | The student is expected to:
(A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;
(B) collect information by observing and measuring in various ways;
(C) organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence;
(D) communicate valid conclusions; and
(E) construct graphs, tables, and charts to organize, examine, and evaluate information. |
| (3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions. | The student is expected to:
(A) analyze, review, and critique hypotheses and theories as to their strengths and weaknesses using scientific evidence and information; and
(C) represent the physical world using models and identify their limitations. |

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| (4) Scientific processes. The student knows how to use a variety of tools and methods to conduct science inquiry. | The student is expected to:
(A) collect, analyze, and record information using tools including beakers, petri dishes, metric-meter sticks, graduated cylinders, weather instruments, timing devices, heating apparatuses, test tubes, safety goggles, spring scales, magnets, balances, microscopes, telescopes, thermometers, calculators, field equipment, compasses, computers, and computer probes. |
| (5) Science concepts. The student knows that there is a relationship between force and motion. | The student is expected to:
(A) identify and describe the changes in position, direction of motion, and speed of an object when acted upon by force;
(B) demonstrate that changes in motion can be measured and graphically represented; and
(C) identify forces that shape features of the Earth including uplifting, movement of water, and volcanic activity. |
| (7) Science concepts. The student knows that complex interactions occur between matter and energy. | The student is expected to:
(A) define the concepts of matter and energy; and
(B) explain and illustrate the interactions between matter and energy in the water cycle and in the decay of biomass. |
| (13) Science concepts. The student knows the structures and functions of Earth systems. | The student is expected to:
(A) summarize the rock cycle. |

Grade 7 Science

(a) Introduction.

- (1) In Grade 7, the study of science includes conducting laboratory investigations and fieldwork using scientific methods, critical-thinking, problem-solving, and using tools such as weather instruments and graphing calculators to collect and analyze information to explain a phenomena.
- (2) As students learn science skills, they identify gravity and phases of the moon as components of the solar system and explore the effects of events such as hurricanes on the Earth. Students use pulleys and levers to understand the relationship between force and motion. Students then relate the concept to processes in the human organism such as the movement of blood. In addition, Grade 7 students study chemical and physical properties of substances, examine the tarnishing of metal or burning of wood as example of chemical processes, and identify physical properties used to place elements on the periodic table.
- (4) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and also should know that science may not answer all questions.
- (5) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems

and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.

- (6) Investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and that methods, models, and conclusions build from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the physical world.
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(b) Knowledge and skills

- (1) Scientific processes. The student conduct laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices.

The student is expected to:

- (A) demonstrate safe practices during laboratory investigations and fieldwork; and
- (B) make wise choices in the use and conservation of resources and the disposal of materials.

- (2) Scientific processes. The student uses scientific methods during fieldwork and laboratory investigations.

The student is expected to:

- (A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;
- (B) collect information by observing and measuring in various ways;
- (C) organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence;
- (D) communicate valid conclusions; and
- (E) construct graphs, tables, and charts to organize, examine, and evaluate information.

- (3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions.

The student is expected to:

- (A) analyze, review, and critique hypotheses and theories as to their strengths and weaknesses using scientific evidence and information; and
- (C) represent the physical world using models and identify their limitations.

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| (4) Scientific processes. The student knows how to use a variety of tools and methods to conduct science inquiry. | The student is expected to:
(A) collect, analyze, and record information using tools including beakers, petri dishes, meter sticks, graduated cylinders, weather instruments, heating apparatuses, dissecting equipment, test tubes, safety goggles, spring scales, balances, microscopes, telescopes, thermometers, graphing calculators, field equipment, compasses, computers, computer probes, timing devices, magnets, and compasses; and
(B) analyze collected information to recognize patterns such as rates of change. |
| (7) Science concepts. The student knows that complex interactions occur between matter and energy. | The student is expected to:
(A) illustrate examples of potential and kinetic energy in everyday life such as objects at rest, movement of geologic faults, and falling water. |
| (13) Science concepts. The student knows that natural events and human activity can alter Earth systems. | The student is expected to:
(A) describe and predict the impact of different catastrophic events on the Earth. |

Grade 8 Science

(a) Introduction.

- (1) In Grade 8, the study of science includes conducting laboratory investigations using scientific methods, analyzing data, critical-thinking, scientific problem-solving, and using tools such as telescopes to collect, analyze, and record information.
- (2) As students learn science skills, they identify the roles of both human activities and natural events in altering Earth systems. Students learn that stars and galaxies are part of the universe, identify light years as a way to describe distance, and learn about scientific theories of the origin of the universe. Cycles within Earth systems are studied as students learn about lunar cycles and the rock cycle.
- (3) Students examine information on the periodic table to recognize that elements are grouped into families. In addition, students demonstrate that exothermic and endothermic chemical reactions indicate that energy is lost or gained during a chemical reaction. Matter and energy are explored through the interactions in solar, weather, and ocean systems. Students identify the origin of waves and investigate their ability to travel through different media.
- (5) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and also should know that science may not answer all questions.
- (6) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.
- (7) Investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and that methods, models, and conclusions build from these investigations change as new observations

are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the physical world.

(b) Knowledge and skills

(1) Scientific processes. The student conduct laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices.

The student is expected to:

- (A) demonstrate safe practices during laboratory investigations and fieldwork; and
- (B) make wise choices in the use and conservation of resources and the disposal of materials.

(2) Scientific processes. The student uses scientific methods during fieldwork and laboratory investigations.

The student is expected to:

- (A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;
- (B) collect information by observing and measuring in various ways;
- (C) organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence;
- (D) communicate valid conclusions; and
- (E) construct graphs, tables, and charts to organize, examine, and evaluate information.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions.

The student is expected to:

- (A) analyze, review, and critique hypotheses and theories as to their strengths and weaknesses using scientific evidence and information; and
- (C) represent the physical world using models and identify their limitations.

(4) Scientific processes. The student knows how to use a variety of tools and methods to conduct science inquiry.

The student is expected to:

- (A) collect, analyze, and record information using tools including beakers, petri dishes, meter sticks, graduated cylinders, weather instruments, heating apparatuses, dissecting equipment, test tubes, safety goggles, spring scales, balances, microscopes, telescopes, thermometers, graphing calculators, field equipment, compasses, computers, computer probes, water test kits, timing devices; and
- (B) extrapolate from collected information to make predictions.

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| (7) Science concepts. The student knows that complex interactions occur between matter and energy. | The student is expected to:
(A) describe interactions within solar, weather, and ocean systems. |
| (10) Science concepts. The students knows that cycles exist in Earth systems. | The student is expected to:
(A) analyze and predict the sequence of events in the lunar and rock cycles. |

Integrated Physics and Chemistry

(b) Introduction.

- (1) In Integrated Physics and Chemistry, students conduct laboratory investigations and fieldwork, use scientific methods during investigations, and make informed decisions using, critical-thinking and scientific problem-solving. This course integrates the disciplines of physics and chemistry in the following topics: motion, waves, energy transformations, properties of matter, changes in matter, and solution chemistry.
 - (2) Science is a way of learning about the natural world. Students should know how science has built a vast body of changing and increasing knowledge described by physical, mathematical, and conceptual models, and also should know that science may not answer all questions.
 - (3) A system is a collection of cycles, structures, and processes that interact. Students should understand a whole in terms of its components and how these components relate to each other and to the whole. All systems have basic properties that can be described in terms of space, time, energy, and matter. Change and constancy occur in systems and can be observed and measured as patterns. These patterns help to predict what will happen next and can change over time.
 - (4) Investigations are used to learn about the natural world. Students should understand that certain types of questions can be answered by investigations, and that methods, models, and conclusions build from these investigations change as new observations are made. Models of objects and events are tools for understanding the natural world and can show how systems work. They have limitations and based on new discoveries are constantly being modified to more closely reflect the physical world.
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(c) Knowledge and skills

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| (1) Scientific processes. The student , for at least 40% of instructional time, conducts laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices. | The student is expected to:
(A) demonstrate safe practices during laboratory investigations and fieldwork; and
(B) make wise choices in the use and conservation of resources and the disposal of materials. |
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(2) Scientific processes. The student uses scientific methods during fieldwork and laboratory investigations.

The student is expected to:

- (A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;
- (B) collect information by observing and measuring in various ways;
- (C) organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence; and
- (D) communicate valid conclusions.

(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions.

The student is expected to:

- (A) analyze, review, and critique hypotheses and theories as to their strengths and weaknesses using scientific evidence and information; and
- (C) represent the physical world using models and identify their limitations.

(6) Science concepts. The student knows the impact of energy transformations in everyday life.

The student is expected to:

- (A) investigate and demonstrate the movement of heat through solids, liquids, and gases by convection, conduction, and radiation;
- (F) analyze the effects of heating and cooling processes in systems such as weather, living, and mechanical.

(7) Science concepts. The student knows relationships exist between properties of matter and its components.

The student is expected to:

- (A) investigate and identify properties of fluids including density, viscosity, and buoyancy;

(8) Science concepts. The student knows that changes in matter affect everyday life.

The student is expected to:

- (A) distinguish between physical and chemical changes in matter such as oxidation, digestion, changes in states, and stages in the rock cycle.