

Learning About Learning

Grades 5-6-7-8-9-10

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

LIFE SCIENCE STANDARDS	
LEVELS 5-8	LEVELS 9-12
Structure and function in living systems	The cell
Regulation and behavior	Behavior of organisms
Diversity and adaptations of organisms	

SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES	
LEVELS 5-8	LEVELS 9-12
Personal health	Personal and community health
Natural hazards	Natural resources
Risks and benefits	Environmental quality
Science and technology in society	Science and technology in local, national, and global challenges

HISTORY AND NATURE OF SCIENCE STANDARDS	
LEVELS 5-8	LEVELS 9-12
Science as a human endeavor	Science as a human endeavor
Nature of science	Nature of scientific knowledge
History of science	Historical perspectives

Texas Essential Knowledge and Skills

Grade 5 Science

(a) Introduction.

- (1) In Grade 5, the study of science includes planning and implementing laboratory investigations and fieldwork using scientific methods, analyzing information, making informed decisions, and using tools such as nets, cameras, and computers to collect and organize information.
- (3) Students learn that adaptations can improve the survival of members of a species, and they explore an organism's niche within an ecosystem. Students continue the study of

organisms by exploring a variety of trait that are inherited by offspring from their parents and study examples of learned characteristics.

- (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 simple 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;
- (B) draw inferences based on information related to promotional material for products and services;
- (C) represent the physical world using models and identify their limitations;
- (D) evaluate the impact or research on scientific thought, society, and the environment;
- (E) connect Grade 5 science concepts with careers; and
- (F) connect Grade 5 science concepts with the history of science and contributions of scientists.

(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 and analyze information using tools including calculators, microscopes, cameras, sound recorders, computers, hand lenses, rulers, thermometers, compasses, balances, meter sticks, timing devices, magnets, collecting nets, and safety goggles; and
- (B) demonstrate that repeated investigations may increase the reliability of results.

(9) Science concepts. The student knows that likenesses between offspring an parent can be inherited or learned.

The student is expected to:

- (A) identify traits that are inherited from parent to offspring in plants and animals; and
- (B) give examples of learned characteristics that result from the influence of the environment.

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.

(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.

(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;
- (B) draw inferences based on information related to promotional material for products and services;
- (C) represent the physical world using models and identify their limitations;
- (D) evaluate the impact or research on scientific thought, society, and the environment;
- (E) connect Grade 6 science concepts with careers; and
- (F) connect Grade 6 science concepts with the history of science and contributions of scientists.

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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; and
(B) identify patterns in collected information using percent, average, range, and frequency. |
| (9) Science concepts. The student knows the relationship between structure and function in living systems. | The student is expected to:
(A) differentiate between structure and function; and
(B) identify how structure complements function at different levels of organization including cells, organs, tissues, organ systems, and organisms. |
| (11) Science concepts. The students knows that the responses of organisms are caused by internal or external stimuli. | The student is expected to:
(A) identify responses to internal stimuli such as hunger or thirst; and
(B) identify responses in organisms due to external stimuli such as the presence or absence of heat or light. |

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.
- (3) Students learn about kinetic and potential energy and identify photosynthesis as an example of the transformation of radiant energy from the sun into chemical energy for use by plants. Students investigate living systems in humans to identify the structures and functions of those systems. Students compare asexual and sexual reproduction to illustrate that genetic materials are responsible for both dominant and recessive traits in organisms.
- (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.

(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;
- (B) draw inferences based on information related to promotional material for products and services;
- (C) represent the physical world using models and identify their limitations;
- (D) evaluate the impact or research on scientific thought, society, and the environment;
- (E) connect Grade 7 science concepts with careers; and
- (F) connect Grade 7 science concepts with the history of science and contributions of scientists.

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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. |
| (8) Science concepts. The student knows the relationship between structure and function in living systems. | The student is expected to:
(A) determine that all organisms are composed of cells which carry on functions needed to sustain life; and
(B) identify the systems of the human organism and describe their functions. |
| (10) Science concepts. The students knows that the responses of organisms are caused by internal or external stimuli. | The student is expected to:
(B) observe and identify changes in organisms resulting from external stimuli such as an earthworm being touched or a pant responding to light. |

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.
 - (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.
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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;
- (B) draw inferences based on information related to promotional material for products and services;
- (C) represent the physical world using models and identify their limitations;
- (D) evaluate the impact or research on scientific thought, society, and the environment;
- (E) connect Grade 8 science concepts with careers; and
- (F) connect Grade 8 science concepts with the history of science and contributions of scientists.

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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, water test kits,, timing devices; and
(B) extrapolate from collected information to make predictions. |
| (8) Science concepts. The student knows the relationship between structure and function in living systems. | The student is expected to:
(A) describe interactions among systems in the human organism;
(B) identify feedback mechanisms that maintain equilibrium of systems such as body temperature, turgor pressure, and chemical reactions. |
| (12) Science concepts. The student knows that natural events and human activities can alter Earth systems. | The student is expected to:
(B) analyze how natural or human events may have contributed to the extinction of some species. |

Biology

(b) Introduction.

- (1) In Biology, students conduct laboratory investigations and fieldwork, use scientific methods during investigations, and make informed decisions using, critical-thinking and scientific problem-solving. Students in Biology study a variety of topics that include: structures and functions of cells and viruses, growth and development of organisms; cells, tissues, organs, nucleic acids, and genetics; biological evolution; taxonomy, metabolism and energy transfers in living organisms; living systems; homeostasis; ecosystems; and plants and the environment.
 - (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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| <p>(1) Scientific processes. The student, for at least 40% of instructional time, conducts laboratory investigations and fieldwork using safe, environmentally appropriate, and ethical practices.</p> | <p>The student is expected to:</p> <ul style="list-style-type: none">(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. |
| <p>(2) Scientific processes. The student uses scientific methods during fieldwork and laboratory investigations.</p> | <p>The student is expected to:</p> <ul style="list-style-type: none">(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. |
| <p>(3) Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions.</p> | <p>The student is expected to:</p> <ul style="list-style-type: none">(A) analyze, review, and critique hypotheses and theories as to their strengths and weaknesses using scientific evidence and information;(B) draw inferences based on information related to promotional material for products and services;(C) represent the physical world using models and identify their limitations;(D) describe connections between biology and future careers; and(E) evaluate models according to their adequacy in representing biological objects or events; and(F) research and describe the history of biology and contributions of scientists. |
| <p>(11) Science concepts. The student knows that organisms maintain homeostasis.</p> | <p>The student is expected to:</p> <ul style="list-style-type: none">(B) investigate and identify how organisms, including humans, respond to external stimuli; and(C) analyze the importance of nutrition, environmental conditions, and physical exercise on health. |