



Elementary Science

Core Curriculum

Grades K-4

THE UNIVERSITY OF THE STATE OF NEW YORK



THE STATE EDUCATION DEPARTMENT

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**Community School District Ten
Science Syllabus K-8**

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Science Syllabus Grade 8

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Elementary Science

Core Curriculum

PREFACE

Why is there a core curriculum?

The *Elementary Science Core Curriculum* has been written to assist teachers and supervisors as they prepare curricula, **daily** instruction, and assessment for the elementary-level (grades K, 1, 2, 3, and 4) content and skills of Standards 1, 2, 4, 6, and 7 of the New York State *Learning Standards for Mathematics, Science, and Technology*.

What is the core curriculum?

The *Learning Standards for Mathematics, Science, and Technology* identifies key ideas and performance indicators. Key ideas are broad, unifying, general statements of what students need to know. The performance indicators for each idea are statements of what students should be able to do to provide evidence that they understand the key ideas. As part of this continuum, this core curriculum guide presents major understandings that give more specific detail to the concepts underlying each performance indicator.

Features:

- This core curriculum is not a syllabus.
- The focus is on conceptual understanding in the guide and is consistent with the approaches in the *National Science Education Standards and Benchmarks for Science Literacy: Project 2061*.
- This is a guide for the preparation of elementary-level curriculum, **daily** instruction, and assessment, the beginning stage in a K–12 continuum of science education.
- This core curriculum specifically addresses only the content and skills to be tested by State examinations.

Applications of the core curriculum: This core curriculum reflects only a portion of the content to be covered in an elementary science program. It is expected that additional content will be supplied locally. This core curriculum reflects the content that must be addressed at the elementary level. Content in this document, especially the major understandings, can appear on State examinations. A core curriculum allows teachers the flexibility and professional freedom to expand upon and develop instruction that addresses the New York State *Learning Standards for Mathematics, Science, and Technology* at the appropriate level for their students. Since this core curriculum contains less than 100% of the content, the time required to teach can vary with the needs of individual students (especially in terms of remediation or acceleration).

The elementary science program should emphasize a hands-on and minds-on approach to learning. Students learn effectively when they are actively engaged in the discovery process, often working in small groups. Experiences should provide students with opportunities to interact as directly as possible with the natural world in order to construct explanations about their world. This approach will allow students to practice problem-solving skills, develop positive science attitudes, learn new science content, and increase their scientific literacy.

Children’s natural curiosity leads them to explore the natural world. They should be provided opportunities to have direct experience with common objects, materials, and living things in their environments. Less important is the memorization of specialized terminology and technical details. Good instruction focuses on understanding important relationships, processes, mechanisms, and applications of concepts. Future assessments will test students’ ability to explain, analyze, and interpret scientific processes and phenomena more than their ability to recall specific facts. It is hoped that the general nature of these statements will encourage the teaching of science for understanding, instead of for memorization. Teachers are encouraged to help their students find concepts that interconnect many of the key ideas to each other.

It is hoped that the units designed using this core curriculum will prepare our students to explore the most important ideas about our physical setting and our living environment. Scientifically literate students understand the basic concepts and processes and can apply them in real-life situations. The science educators throughout New York State who collaborated on the writing of this guide believe that curricula based on this guide will contribute to the scientific literacy of all students.

Investigations: Critical to understanding science concepts is the use of scientific inquiry to develop explanations of natural phenomena. Therefore, it is recommended that students have the opportunity to develop their skills of mathematical analysis, scientific inquiry, and engineering design through investigations on a regular basis in grades K, 1, 2, 3, and 4. Active investigations will nurture student curiosity and develop positive attitudes toward science which will last a lifetime.

INQUIRY AND PROCESS SKILLS BASED ON ALL STANDARDS

It should be a goal of the instructor to foster the development of science process skills. The application of these skills allows students to investigate important issues in the world around them.

Inquiry-based units will include many or most of the following process skills. These process skills should be incorporated into students' instruction as developmentally appropriate.

Classifying – arranging or distributing objects, events, or information representing objects or events in classes according to some method or system

Communicating – giving oral and written explanations or graphic representations of observations

Comparing and contrasting – identifying similarities and differences between or among objects, events, data, systems, etc.

Creating models – displaying information, using multisensory representations

Gathering and organizing data – collecting information about objects and events which illustrate a specific situation

Generalizing – drawing general conclusions from particulars

Identifying variables – recognizing the characteristics of objects or factors in events that are constant or change under different conditions

Inferring – drawing a conclusion based on prior experiences

Interpreting data – analyzing data that have been obtained and organized by determining apparent patterns or relationships in the data

Making decisions – identifying alternatives and choosing a course of action from among the alternatives after basing the judgment for the selection on justifiable reasons

Manipulating materials – handling or treating materials and equipment safely, skillfully, and effectively

Measuring – making quantitative observations by comparing to a conventional or nonconventional standard

Observing – becoming aware of an object or event by using any of the senses (or extensions of the senses) to identify properties

Predicting – making a forecast of future events or conditions expected to exist

Note: As an example, these processes are applied in the three key ideas in Standard 1, which outline scientific inquiry. Inquiry may proceed in a cyclical pattern, with students moving from Key Idea 1 to Key Idea 3 and back to 1 again.

PROCESS SKILLS BASED ON STANDARDS 1, 2, 6, AND 7:

Science process skills should be based on a series of discoveries. Students learn most effectively when they have a central role in the discovery process. To that end, Standards 1, 2, 6, and 7 incorporate in the Elementary Science Core Curriculum a student-centered, problem-solving approach to intermediate science. The following is an expanded version of the skills found in Standards 1, 2, 6, and 7 of the Learning Standards for Mathematics, Science, and Technology. This list is not intended to be an all-inclusive list of the content or skills that teachers are expected to incorporate into their curriculum. It should be a goal of the instructor to encourage science process skills that will provide students with background and curiosity sufficient to prompt investigation of important issues in the world around them.

Note: the use of e.g. denotes examples which may be used for in-depth study. The terms for example and such as denote material which is testable. Items in parenthesis denote further definition of the word(s) preceding the item and are testable.

STANDARD 1—Analysis, Inquiry, and Design

Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

STANDARD 1 Analysis, Inquiry, and Design

MATHEMATICAL ANALYSIS:

Key Idea 1:

Abstraction and symbolic representation are used to communicate mathematically.

M1.1 Use special mathematical notation and symbolism to communicate in mathematics and to compare and describe quantities, express relationships, and relate mathematics to their immediate environment.

M1.1a Use plus, minus, greater than, less than, equal to, multiplication, and division signs

M1.1b Select the appropriate operation to solve mathematical problems

M1.1c Apply mathematical skills to describe the natural world

Key Idea 2:

Deductive and inductive reasoning are used to reach mathematical conclusions.

M2.1 Use simple logical reasoning to develop conclusions, recognizing that patterns and relationships present in the environment assist them in reaching these conclusions.

M2.1a Explain verbally, graphically, or in writing the reasoning used to develop mathematical conclusions

M2.1b Explain verbally, graphically, or in writing patterns and relationships observed in the physical and living environment

Key Idea 3:

Critical thinking skills are used in the solution of mathematical problems.

M3.1 Explore and solve problems generated from school, home, and community situations, using concrete objects or manipulative materials when possible.

M3.1a Use appropriate scientific tools, such as metric rulers, spring scale, pan balance, graph paper, thermometers [Fahrenheit and Celsius], graduated cylinder to solve problems about the natural world

**STANDARD 1
Analysis, Inquiry,
and Design**

SCIENTIFIC INQUIRY:

Key Idea 1:

The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.

- S1.1 Ask "why" questions in attempts to seek greater understanding concerning objects and events they have observed and heard about.
 - S1.1a Observe and discuss objects and events and record observations
 - S1.1b Articulate appropriate questions based on observations
- S1.2 Question the explanations they hear from others and read about, seeking clarification and comparing them with their own observations and understandings.
 - S1.2a Identify similarities and differences between explanations received from others or in print and personal observations or understandings
- S1.3 Develop relationships among observations to construct descriptions of objects and events and to form their own tentative explanations of what they have observed.
 - S1.3a Clearly express a tentative explanation or description which can be tested

Key Idea 2:

Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity.

- S2.1 Develop written plans for exploring phenomena or for evaluating explanations guided by questions or proposed explanations they have helped formulate.
 - S2.1a Indicate materials to be used and steps to follow to conduct the investigation and describe how data will be recorded (journal, dates and times, etc.)
- S2.2 Share their research plans with others and revise them based on their suggestions.
 - S2.2a Explain the steps of a plan to others, actively listening to their suggestions for possible modification of the plan, seeking clarification and understanding of the suggestions and modifying the plan where appropriate
- S2.3 Carry out their plans for exploring phenomena through direct observation and through the use of simple instruments that permit measurement of quantities, such as length, mass, volume, temperature, and time.
 - S2.3a Use appropriate "inquiry and process skills" to collect data
 - S2.3b Record observations accurately and concisely

Key Idea 3:

The observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into phenomena.

- S3.1 Organize observations and measurements of objects and events through classification and the preparation of simple charts and tables.
 - S3.1a Accurately transfer data from a science journal or notes to appropriate graphic organizer
- S3.2 Interpret organized observations and measurements, recognizing simple patterns, sequences, and relationships.
 - S3.2a State, orally and in writing, any inferences or generalizations indicated by the data collected
- S3.3 Share their findings with others and actively seek their interpretations and ideas.
 - S3.3a Explain their findings to others, and actively listen to suggestions for possible interpretations and ideas
- S3.4 Adjust their explanations and understandings of objects and events based on their findings and new ideas.
 - S3.4a State, orally and in writing, any inferences or generalizations indicated by the data, with appropriate modifications of their original prediction/explanation
 - S3.4b State, orally and in writing, any new questions that arise from their investigation

**STANDARD 1
Analysis, Inquiry,
and Design:**

**ENGINEERING
DESIGN:**

Key Idea 1:

Engineering design is an iterative process involving modeling and optimization (finding the best solution within given constraints); this process is used to develop technological solutions to problems within given constraints.

T1.1 Describe objects, imaginary or real, that might be modeled or made differently and suggest ways in which the objects can be changed, fixed, or improved.

T1.1a Identify a simple/common object which might be improved and state the purpose of the improvement

T1.1b Identify features of an object that help or hinder the performance of the object

T1.1c Suggest ways the object can be made differently, fixed, or improved within given constraints

T1.2 Investigate prior solutions and ideas from books, magazines, family, friends, neighbors, and community members.

T1.2a Identify appropriate questions to ask about the design of an object

T1.2b Identify the appropriate resources to use to find out about the design of an object

T1.2c Describe prior designs of the object

T1.3 Generate ideas for possible solutions, individually and through group activity; apply age-appropriate mathematics and science skills; evaluate the ideas and determine the best solution; and explain reasons for the choices.

T1.3a List possible solutions, applying age-appropriate math and science skills

T1.3b Develop and apply criteria to evaluate possible solutions

T1.3c Select a solution consistent with given constraints and explain why it was chosen

T1.4 Plan and build, under supervision, a model of the solution, using familiar materials, processes, and hand tools.

T1.4a Create a grade-appropriate graphic or plan listing all materials needed, showing sizes of parts, indicating how things will fit together, and detailing steps for assembly

T1.4b Build a model of the object, modifying the plan as necessary

T1.5 Discuss how best to test the solution; perform the test under teacher supervision; record and portray results through numerical and graphic means; discuss orally why things worked or didn't work; and summarize results in writing, suggesting ways to make the solution better.

T1.5a Determine a way to test the finished solution or model

T1.5b Perform the test and record the results, numerically and/or graphically

T1.5c Analyze results and suggest how to improve the solution or model, using oral, graphic, or written formats

STANDARD 2—Information Systems

Students will access, generate, process, and transfer information using appropriate technologies.

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| STANDARD 2 Information Systems | <p><i>Key Idea 1:</i> Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.</p> <ul style="list-style-type: none">• use computer technology, traditional paper-based resources, and interpersonal discussions to learn, do, and share science in the classroom• select appropriate hardware and software that aids in word processing, creating databases, telecommunications, graphing, data display, and other tasks• use information technology to link the classroom to world events <p><i>Key Idea 2:</i> Knowledge of the impacts and limitations of information systems is essential to its effectiveness and ethical use.</p> <ul style="list-style-type: none">• use a variety of media to access scientific information• consult several sources of information and points of view before drawing conclusions• identify and report sources in oral and written communications <p><i>Key Idea 3:</i> Information technology can have positive and negative impacts on society, depending upon how it is used.</p> <ul style="list-style-type: none">• distinguish fact from fiction (presenting opinion as fact is contrary to the scientific process)• demonstrate an ability to critically evaluate information and misinformation• recognize the impact of information technology on the daily life of students |
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STANDARD 6—Interconnectedness: Common Themes

Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.

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| STANDARD 6 Systems Thinking | <p><i>Key Idea 1:</i> Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.</p> <ul style="list-style-type: none">• observe and describe interactions among components of simple systems• identify common things that can be considered to be systems (e.g., a plant, a transportation system, human beings) |
|--|--|

**STANDARD 6
Models**

Key Idea 2:

Models are simplified representations of objects, structures, or systems, used in analysis, explanation, or design.

- analyze, construct, and operate models in order to discover attributes of the real thing
- discover that a model of something is different from the real thing but can be used to study the real thing
- use different types of models, such as graphs, sketches, diagrams, and maps, to represent various aspects of the real world

**STANDARD 6
Magnitude and Scale**

Key Idea 3:

The grouping of magnitudes of size, time, frequency, and pressures or other units of measurement into a series of relative order provides a useful way to deal with the immense range and the changes in scale that affect behavior and design of systems.

- observe that things in nature and things that people make have very different sizes, weights, and ages
- recognize that almost anything has limits on how big or small it can be

**STANDARD 6
Equilibrium and
Stability**

Key Idea 4:

Equilibrium is a state of stability due either to a lack of changes (static equilibrium) or a balance between opposing forces (dynamic equilibrium).

- observe that things change in some ways and stay the same in some ways
- recognize that things can change in different ways such as size, weight, color, and movement. Some small changes can be detected by taking measurements.

**STANDARD 6
Patterns of Change**

Key Idea 5:

Identifying patterns of change is necessary for making predictions about future behavior and conditions.

- use simple instruments to measure such quantities as distance, size, and weight and look for patterns in the data
- analyze data by making tables and graphs and looking for patterns of change

**STANDARD 6
Optimization**

Key Idea 6:

In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.

- choose the best alternative of a set of solutions under given constraints
- explain the criteria used in selecting a solution orally and in writing

STANDARD 7—Interdisciplinary Problem Solving

Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.

STANDARD 7 Connections

Key Idea 1:

The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena.

- analyze science/technology/society problems and issues that affect their home, school, or community, and carry out a remedial course of action
- make informed consumer decisions by applying knowledge about the attributes of particular products and making cost/benefit trade-offs to arrive at an optimal choice
- design solutions to problems involving a familiar and real context, investigate related science concepts to determine the solution, and use mathematics to model, quantify, measure, and compute
- observe phenomena and evaluate them scientifically and mathematically by conducting a fair test of the effect of variables and using mathematical knowledge and technological tools to collect, analyze, and present data and conclusions

STANDARD 7 Strategies

Key Idea 2:

Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.

- work effectively
- gather and process information
- generate and analyze ideas
- observe common themes
- realize ideas
- present results

SKILLS AND STRATEGIES FOR INTERDISCIPLINARY PROBLEM SOLVING

Working Effectively – contributing to the work of a brainstorming group, laboratory partnership, cooperative learning group, or project team; planning procedures; identifying and managing responsibilities of team members; and staying on task, whether working alone or as part of a group

Gathering and Processing Information – accessing information from printed media, electronic databases, and community resources; using the information to develop a definition of the problem and to research possible solutions

Generating and Analyzing Ideas – developing ideas for proposed solutions, investigating ideas, collecting data, and showing relationships and patterns in the data

Common Themes – observing examples of common unifying themes, applying them to the problem, and using them to better understand the dimensions of the problem

Realizing Ideas – constructing components or models, arriving at a solution, and evaluating the results

Presenting Results – using a variety of media to present the solution and to communicate the results

PROCESS SKILLS BASED ON STANDARD 4

Science is an ongoing process. Most often there is a question or problem that initiates an investigation searching for a possible solution or solutions. There is no single prescribed scientific method to govern an investigation. It is important that students practice the skills outlined below. For younger students, the emphasis is on discovery. For older students, the emphasis is on formulating and investigating their own questions.

Note: the use of e.g. denotes examples which may be used for in-depth study. The terms for example and such as denote material which is testable. Items in parenthesis denote further definition of the word(s) preceding the item and are testable.

General Skills

- i. follow safety procedures in the classroom, laboratory, and field
- ii. safely and accurately use the following tools:
 - hand lens
 - ruler (metric)
 - balance
 - gram weights
 - spring scale
 - thermometer (C°, F°)
 - measuring cups
 - graduated cylinder
 - timepiece(s)
- iii. develop an appreciation of and respect for all learning environments (classroom, laboratory, field, etc.)
- iv. manipulate materials through teacher direction and free discovery
- v. use information systems appropriately
- vi. select appropriate standard and nonstandard measurement tools for measurement activities
- vii. estimate, find, and communicate measurements, using standard and nonstandard units
- viii. use and record appropriate units for measured or calculated values
- ix. order and sequence objects and/or events
- x. classify objects according to an established scheme
- xi. generate a scheme for classification
- xii. utilize senses optimally for making observations
- xiii. observe, analyze, and report observations of objects and events
- xiv. observe, identify, and communicate patterns
- xv. observe, identify, and communicate cause-and-effect relationships
- xvi. generate appropriate questions (teacher and student based) in response to observations, events, and other experiences
- xvii. observe, collect, organize, and appropriately record data, then accurately interpret results
- xviii. collect and organize data, choosing the appropriate representation:
 - journal entries
 - graphic representations
 - drawings/pictorial representations
- xix. make predictions based on prior experiences and/or information
- xx. compare and contrast organisms/objects/events in the living and physical environments
- xxi. identify and control variables/factors
- xxii. plan, design, and implement a short-term and long-term investigation based on a student- or teacher-posed problem
- xxiii. communicate procedures and conclusions through oral and written presentations

STANDARD 4: The Physical Setting

Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Key Idea 1:

The Earth and celestial phenomena can be described by principles of relative motion and perspective.

The universe is made up of many different objects. Students should observe and describe the motions of the Sun, Moon, and stars. The movement of these objects through space can be traced and measured over various time segments.

By keeping daily records, students will learn to identify sequences of changes and look for patterns; this skill will be useful throughout their study of the natural world. Younger students should draw what they see. Older students should be encouraged to keep journals and use instruments to measure and record their observations.

Note: Students at this age are concrete thinkers; therefore, only the effects of gravity they can directly observe should be discussed. Drawing models that show size and position and discussing phenomena based on gravity are too abstract and may lead to misconceptions.

Note: the use of e.g. denotes examples which may be used for in-depth study. The terms for example and such as denote material which is testable. Items in parenthesis denote further definition of the word(s) preceding the item and are testable.

Describe patterns of daily, monthly, and seasonal changes in their environment.

PERFORMANCE INDICATOR 1.1

Major Understandings:

1.1a Natural cycles and patterns include:

- Earth spinning around once every 24 hours (rotation), resulting in day and night
- Earth moving in a path around the Sun (revolution), resulting in one Earth year
- the length of daylight and darkness varying with the seasons
- weather changing from day to day and through the seasons
- the appearance of the Moon changing as it moves in a path around Earth to complete a single cycle

1.1b Humans organize time into units based on natural motions of Earth:

- second, minute, hour
- week, month

1.1c The Sun and other stars appear to move in a recognizable pattern both daily and seasonally.

Key Idea 2:

Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

The water cycle, weather, erosion, deposition, and extreme natural events involve interactions among air, water, and land. Students should observe and describe naturally occurring changes in their world involving these phenomena. They can also investigate these phenomena in classroom experiments.

Younger students should be engaged in observation of their immediate surroundings with emphasis on recognizing change around them. As students mature, they can begin to recognize cycles and identify the processes and natural events which are causing the changes they are observing.

PERFORMANCE INDICATOR 2.1

Describe the relationship among air, water, and land on Earth.

Major Understandings:

- 2.1a Weather is the condition of the outside air at a particular moment.
- 2.1b Weather can be described and measured by:
 - temperature
 - wind speed and direction
 - form and amount of precipitation
 - general sky conditions (cloudy, sunny, partly cloudy)
- 2.1c Water is recycled by natural processes on Earth.
 - evaporation: changing of water (liquid) into water vapor (gas)
 - condensation: changing of water vapor (gas) into water (liquid)
 - precipitation: rain, sleet, snow, hail
 - runoff: water flowing on Earth's surface
 - groundwater: water that moves downward into the ground
- 2.1d Erosion and deposition result from the interaction among air, water, and land.
 - interaction between air and water breaks down earth materials
 - pieces of earth material may be moved by air, water, wind, and gravity
 - pieces of earth material will settle or deposit on land or in the water in different places
 - soil is composed of broken-down pieces of living and nonliving earth material
- 2.1e Extreme natural events (floods, fires, earthquakes, volcanic eruptions, hurricanes, tornadoes, and other severe storms) may have positive or negative impacts on living things.

Key Idea 3:

Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

Students should describe, categorize, compare, and measure observable physical properties of matter and objects. Students' initial efforts in performing these processes may yield simple descriptions and sketches, which may lead to increasingly more detailed drawings and richer verbal descriptions. Things can be done to materials to change their properties, but not all materials respond in the same way to what is done to them. Younger students emphasize physical properties while older students will recognize chemical changes. Appropriate tools can aid students in their efforts.

PERFORMANCE INDICATOR 3.1

Observe and describe properties of materials, using appropriate tools.

Major Understandings:

3.1a Matter takes up space and has mass. Two objects cannot occupy the same place at the same time.

3.1b Matter has properties (color, hardness, odor, sound, taste, etc.) that can be observed through the senses.

3.1c Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light.

3.1d Measurements can be made with standard metric units and nonstandard units. (*Note: Exceptions to the metric system usage are found in meteorology.*)

3.1e The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders.

3.1f Objects and/or materials can be sorted or classified according to their properties.

3.1g Some properties of an object are dependent on the conditions of the present surroundings in which the object exists. For example:

- temperature - hot or cold
- lighting - shadows, color
- moisture - wet or dry

PERFORMANCE INDICATOR 3.2

Describe chemical and physical changes, including changes in states of matter.

Major Understandings:

3.2a Matter exists in three states: solid, liquid, gas.

- solids have a definite shape and volume
- liquids do not have a definite shape but have a definite volume
- gases do not hold their shape or volume

3.2b Temperature can affect the state of matter of a substance.

3.2c Changes in the properties or materials of objects can be observed and described.

Key Idea 4:

Energy exists in many forms, and when these forms change energy is conserved.

Students should understand that energy exists in a variety of forms. Students should observe the results of simple energy transformations from one form to another in their physical environment. The safe use and respect of various energy forms should be stressed in the classroom.

Note: Attempting to understand heat and its difference from temperature is too abstract a concept for elementary students. Energy is a subject that is difficult for students to understand. Students cannot hold it in their hands and, with the exception of light, they cannot see it.

PERFORMANCE INDICATOR 4.1 Describe a variety of forms of energy (e.g., heat, chemical, light) and the changes that occur in objects when they interact with those forms of energy.

Major Understandings:

- 4.1a Energy exists in various forms: heat, electric, sound, chemical, mechanical, light.
- 4.1b Energy can be transferred from one place to another.
- 4.1c Some materials transfer energy better than others (heat and electricity).
- 4.1d Energy and matter interact: water is evaporated by the Sun's heat; a bulb is lighted by means of electrical current; a musical instrument is played to produce sound; dark colors may absorb light, light colors may reflect light.
- 4.1e Electricity travels in a closed circuit.
- 4.1f Heat can be released in many ways, for example, by burning, rubbing (friction), or combining one substance with another.
- 4.1g Interactions with forms of energy can be either helpful or harmful.

PERFORMANCE INDICATOR 4.2 Observe the way one form of energy can be transferred into another form of energy present in common situations (e.g., mechanical to heat energy, mechanical to electrical energy, chemical to heat energy).

Major Understandings:

- 4.2a Everyday events involve one form of energy being changed to another.
 - animals convert food to heat and motion
 - the Sun's energy warms the air and water
- 4.2b Humans utilize interactions between matter and energy.
 - chemical to electrical, light, and heat: battery and bulb
 - electrical to sound (e.g., doorbell buzzer)
 - mechanical to sound (e.g., musical instruments, clapping)
 - light to electrical (e.g., solar-powered calculator)

Key Idea 5:

Energy and matter interact through forces that result in changes in motion.

Students should be able to observe and describe relative positions between objects in their world. Exploring the observable effects of gravity and magnetism may help students develop an understanding of the reason for the direction of an object's motion. Manipulation and application of simple tools and machines may help students learn about the relationships between forces and motion.

PERFORMANCE INDICATOR 5.1 Describe the effects of common forces (pushes and pulls) of objects, such as those caused by gravity, magnetism, and mechanical forces.

Major Understandings:

- 5.1a The position of an object can be described by locating it relative to another object or the background (e.g., on top of, next to, over, under, etc.).
- 5.1b The position or direction of motion of an object can be changed by pushing or pulling.
- 5.1c The force of gravity pulls objects toward the center of Earth.
- 5.1d The amount of change in the motion of an object is affected by friction.
- 5.1e Magnetism is a force that may attract or repel certain materials.
- 5.1f Mechanical energy may cause change in motion through the application of force and through the use of simple machines such as pulleys, levers, and inclined planes.

PERFORMANCE INDICATOR 5.2 Describe how forces can operate across distances.

Major Understandings:

- 5.2a The forces of gravity and magnetism can affect objects through gases, liquids, and solids.
- 5.2b The force of magnetism on objects decreases as distance increases.

STANDARD 4: The Living Environment

Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Key Idea 1:

Living things are both similar to and different from each other and from nonliving things.

There are basic characteristics, needs, and functions common to all living things. Nonliving things are present in nature or are made by living things.

Younger students' ideas about the characteristics of organisms develop from their basic concepts of living and nonliving things. As students are given opportunities to observe and classify living and nonliving things, they should be reminded that living and nonliving things are sometimes given attributes they do not really have.

Understanding the variety and complexity of life and its processes can help students develop respect for their own and for all life. It should also lead them to better realize the value of all life on this fragile planet.

PERFORMANCE INDICATOR 1.1 Describe the characteristics of and variations between living and nonliving things.

Major Understandings:

- 1.1a Animals need air, water, and food in order to live and thrive.
- 1.1b Plants require air, water, nutrients, and light in order to live and thrive.
- 1.1c Nonliving things do not live and thrive.
- 1.1d Nonliving things can be human-created or naturally occurring.

PERFORMANCE INDICATOR 1.2 Describe the life processes common to all living things.

Major Understandings:

- 1.2a Living things grow, take in nutrients, breathe, reproduce, eliminate waste, and die.

Key Idea 2:

Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.

As students investigate the continuity of life, emphasis should be placed on how plants and animals reproduce their own kind.

Teachers should lead students to make observations about how the offspring of familiar animals compare to one another and to their parents. Students know that animals reproduce their own kind—rabbits have rabbits (but you can usually tell one baby from another), cats have kittens that have different markings (but cats never have puppies), and so forth. This idea should be strengthened by a large number of examples, both plant and animal, upon which the students can draw.

Students should move from describing individuals directly (e.g., she has blue eyes) to naming traits and classifying individuals with respect to those traits (e.g., eye color: blue). Students can be encouraged to keep lists of things that animals and plants get from their parents, things that they don't get, and things that the students are not sure about either way.

PERFORMANCE INDICATOR 2.1

Recognize that traits of living things are both inherited and acquired or learned.

Major Understandings:

2.1a Some traits of living things have been inherited (e.g., color of flowers and number of limbs of animals).

2.1b Some characteristics result from an individual's interactions with the environment and cannot be inherited by the next generation (e.g., having scars; riding a bicycle).

PERFORMANCE INDICATOR 2.2

Recognize that for humans and other living things there is genetic continuity between generations.

Major Understandings:

2.2a Plants and animals closely resemble their parents and other individuals in their species.

2.2b Plants and animals can transfer specific traits to their offspring when they reproduce.

Key Idea 3:

Individual organisms and species change over time.

Throughout time, plants and animals have changed depending on their environment. In learning how organisms have been successful in their habitats, students should observe and record information about plants and animals. They should begin to recognize how differences among individuals within a species can help an organism or population to survive. Students at this level will identify the behaviors and physical adaptations that allow organisms to survive in their environment.

PERFORMANCE INDICATOR 3.1

Describe how the structures of plants and animals complement the environment of the plant or animal.

Major Understandings:

3.1a Each animal has different structures that serve different functions in growth, survival, and reproduction.

- wings, legs, or fins enable some animals to seek shelter and escape predators
- the mouth, including teeth, jaws, and tongue, enables some animals to eat and drink
- eyes, nose, ears, tongue, and skin of some animals enable the animals to sense their surroundings
- claws, shells, spines, feathers, fur, scales, and color of body covering enable some animals to protect themselves from predators and other environmental conditions, or enable them to obtain food
- some animals have parts that are used to produce sounds and smells to help the animal meet its needs
- the characteristics of some animals change as seasonal conditions change (e.g., fur grows and is shed to help regulate body heat; body fat is a form of stored energy and it changes as the seasons change)

PERFORMANCE INDICATOR 3.1

continued

3.1b Each plant has different structures that serve different functions in growth, survival, and reproduction.

- roots help support the plant and take in water and nutrients
- leaves help plants utilize sunlight to make food for the plant
- stems, stalks, trunks, and other similar structures provide support for the plant
- some plants have flowers
- flowers are reproductive structures of plants that produce fruit which contains seeds
- seeds contain stored food that aids in germination and the growth of young plants

3.1c In order to survive in their environment, plants and animals must be adapted to that environment.

- seeds disperse by a plant's own mechanism and/or in a variety of ways that can include wind, water, and animals
- leaf, flower, stem, and root adaptations may include variations in size, shape, thickness, color, smell, and texture
- animal adaptations include coloration for warning or attraction, camouflage, defense mechanisms, movement, hibernation, and migration

PERFORMANCE INDICATOR 3.2

Observe that differences within a species may give individuals an advantage in surviving and reproducing.

Major Understandings:

3.2a Individuals within a species may compete with each other for food, mates, space, water, and shelter in their environment.

3.2b All individuals have variations, and because of these variations, individuals of a species may have an advantage in surviving and reproducing.

Key Idea 4:

The continuity of life is sustained through reproduction and development.

It is essential for organisms to produce offspring so that their species will continue. Patterns of reproduction, growth, and development of an organism are stages in its life cycle. Life cycle stages are sequential and occur throughout the life span of the organism. The characteristics of the cycle of life vary from organism to organism.

Note: Younger students may have difficulty in recognizing the continuity of life. Using organisms with a short life cycle as examples will be important in getting the concept across. It is important for younger students to observe life cycle changes in selected animals.

PERFORMANCE INDICATOR 4.1

Describe the major stages in the life cycles of selected plants and animals.

Major Understandings:

4.1a Plants and animals have life cycles. These may include beginning of a life, development into an adult, reproduction as an adult, and eventually death.

4.1b Each kind of plant goes through its own stages of growth and development that may include seed, young plant, and mature plant.

PERFORMANCE INDICATOR 4.1

continued

4.1c The length of time from beginning of development to death of the plant is called its life span.

4.1d Life cycles of some plants include changes from seed to mature plant.

4.1e Each generation of animals goes through changes in form from young to adult. This completed sequence of changes in form is called a life cycle. Some insects change from egg to larva to pupa to adult.

4.1f Each kind of animal goes through its own stages of growth and development during its life span.

4.1g The length of time from an animal's birth to its death is called its life span. Life spans of different animals vary.

PERFORMANCE INDICATOR 4.2

Describe evidence of growth, repair, and maintenance, such as nails, hair, and bone, and the healing of cuts and bruises.

Major Understandings:

4.2a Growth is the process by which plants and animals increase in size.

4.2b Food supplies the energy and materials necessary for growth and repair.

Key Idea 5:

Organisms maintain a dynamic equilibrium that sustains life.

Students need many opportunities to observe a variety of organisms for the patterns of similarities and differences of the life functions used to sustain life. All organisms carry out basic life functions in order to sustain life. These life functions include growing, taking in nutrients, breathing, reproducing, and eliminating waste. Students need many opportunities to observe and compare these similarities and differences in a variety of organisms. Specimens that could provide these opportunities may include guppies, mealworms, and gerbils, as well as fish, insects, mammals, birds, amphibians, reptiles, plants, and fungi.

PERFORMANCE INDICATOR 5.1

Describe basic life functions of common living specimens (e.g., guppies, mealworms, gerbils).

Major Understandings:

5.1a All living things grow, take in nutrients, breathe, reproduce, and eliminate waste.

5.1b An organism's external physical features can enable it to carry out life functions in its particular environment.

PERFORMANCE INDICATOR 5.2 Describe some survival behaviors of common living specimens.

Major Understandings:

5.2a Plants respond to changes in their environment. For example, the leaves of some green plants change position as the direction of light changes; the parts of some plants undergo seasonal changes that enable the plant to grow; seeds germinate, and leaves form and grow.

5.2b Animals respond to change in their environment, (e.g., perspiration, heart rate, breathing rate, eye blinking, shivering, and salivating).

5.2c Senses can provide essential information (regarding danger, food, mates, etc.) to animals about their environment.

5.2d Some animals, including humans, move from place to place to meet their needs.

5.2e Particular animal characteristics are influenced by changing environmental conditions including: fat storage in winter, coat thickness in winter, camouflage, shedding of fur.

5.2f Some animal behaviors are influenced by environmental conditions. These behaviors may include: nest building, hibernating, hunting, migrating, and communicating.

5.2g The health, growth, and development of organisms are affected by environmental conditions such as the availability of food, air, water, space, shelter, heat, and sunlight.

PERFORMANCE INDICATOR 5.3 Describe the factors that help promote good health and growth in humans.

Major Understandings:

5.3a Humans need a variety of healthy foods, exercise, and rest in order to grow and maintain good health.

5.3b Good health habits include hand washing and personal cleanliness; avoiding harmful substances (including alcohol, tobacco, illicit drugs); eating a balanced diet; engaging in regular exercise.

Key Idea 6:

Plants and animals depend on each other and their physical environment.

Plants and animals interact in a number of ways that affect their survival. The survival of plants and animals varies, in response to their particular environment. As the physical environment changes over time, plants and animals change.

Younger students should focus on simple, observable associations of organisms with their environments. Their studies of interactions among organisms within an environment should start with relationships they can directly observe.

Note: Although the concept of plants making their own food may be difficult for elementary students to grasp, they should understand that the Sun is the ultimate source of energy for life and physical cycles on Earth.

**PERFORMANCE
INDICATOR 6.1**

Describe how plants and animals, including humans, depend upon each other and the nonliving environment.

Major Understandings:

- 6.1a Green plants are producers because they provide the basic food supply for themselves and animals.
- 6.1b All animals depend on plants. Some animals (predators) eat other animals (prey).
- 6.1c Animals that eat plants for food may in turn become food for other animals. This sequence is called a food chain.
- 6.1d Decomposers are living things that play a vital role in recycling nutrients.
- 6.1e An organism's pattern of behavior is related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and other resources, and the physical characteristics of the environment.
- 6.1f When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.

**PERFORMANCE
INDICATOR 6.2**

Describe the relationship of the Sun as an energy source for living and nonliving cycles.

Major Understandings:

- 6.2a Plants manufacture food by utilizing air, water, and energy from the Sun.
- 6.2b The Sun's energy is transferred on Earth from plants to animals through the food chain.
- 6.2c Heat energy from the Sun powers the water cycle (see Physical Science Key Idea 2).

Key Idea 7:

Human decisions and activities have had a profound impact on the physical and living environments.

Humans are dependent upon and have an impact on their environment. Students should recognize how human decisions cause environmental changes to occur.

Students should be given opportunities to identify and investigate the factors that positively or negatively affect the physical environment and its resources.

PERFORMANCE INDICATOR 7.1 Identify ways in which humans have changed their environment and the effects of those changes.

Major Understandings:

7.1a Humans depend on their natural and constructed environments.

7.1b Over time humans have changed their environment by cultivating crops and raising animals, creating shelter, using energy, manufacturing goods, developing means of transportation, changing populations, and carrying out other activities.

7.1c Humans, as individuals or communities, change environments in ways that can be either helpful or harmful for themselves and other organisms.

APPENDIX

Sample Elementary Matrices

The following sample matrices may be used to develop curriculum at the elementary level. Each matrix option is an example of an organizational tool. Use these matrices with the major understandings found in the elementary-level core curriculum to develop a curriculum checklist or a grade by grade curriculum with other additional elements. For your convenience an open matrix with major understandings from Standard 4 is provided for the development of Options 1 – 4. All matrices may be used to develop curriculum, which includes Standards 1, 2, 4, 6, and 7 of the *Learning Standards for Mathematics, Science, and Technology*.

Option 1:

| Major Understanding | PreK | K | 1 | 2 | 3 | 4 |
|---------------------|------|---|---|---|---|---|
| | | | | | | |
| | | | | | | |

Option 2:

| Major Understanding | PreK–K | 1–2 | 3–4 |
|---------------------|--------|-----|-----|
| | | | |
| | | | |

Option 3:

Grade Level:

| Major Understanding | Assessment | Learning Experience | Resource |
|---------------------|------------|---------------------|----------|
| | | | |
| | | | |

Option 4:

| Major Understanding | Level (Intro, Mastery, Extension) | Inquiry & Process Skills | Assessment |
|---------------------|---|-----------------------------|------------|
| | | | |
| | | | |

Option 5:

| Key Idea/Major Understanding: | | | | |
|--------------------------------------|------------------|-----------------------------------|---------------------------|-----------------------------|
| Grade Level | Kit Title | Inquiry and Process Skills | Standard 7 Project | Additional Resources |
| Pre-K | | | | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |

MAJOR UNDERSTANDINGS: The Physical Setting

| | | |
|--------------------------------|--|--|
| PERFORMANCE INDICATORS: | | |
| 1.1a | <p>Natural cycles and patterns include:</p> <ul style="list-style-type: none"> • Earth spinning around once every 24 hours (rotation), resulting in day and night • Earth moving in a path around the Sun (revolution), resulting in one Earth year • the length of daylight and darkness varying with the seasons • weather changing from day to day and through the seasons • the appearance of the Moon changing as it moves in a path around Earth to complete a single cycle | |
| 1.1b | <p>Humans organize time into units based on natural motions of Earth:</p> <ul style="list-style-type: none"> • second, minute, hour • week, month | |
| 1.1c | <p>The Sun and other stars appear to move in a recognizable pattern both daily and seasonally.</p> | |
| 2.1a | <p>Weather is the condition of the outside air at a particular moment.</p> | |
| 2.1b | <p>Weather can be described and measured by:</p> <ul style="list-style-type: none"> • temperature • wind speed and direction • form and amount of precipitation • general sky conditions (cloudy, sunny, partly cloudy) | |

| MAJOR UNDERSTANDINGS | | |
|----------------------|---|--|
| 2.1c | <p>Water is recycled by natural processes on Earth.</p> <ul style="list-style-type: none"> • evaporation: changing of water (liquid) into water vapor (gas) • condensation: changing of water vapor (gas) into water (liquid) • precipitation: rain, sleet, snow, hail • runoff: water flowing on Earth's surface • groundwater: water that moves downward into the ground | |
| 2.1d | <p>Erosion and deposition result from the interaction among air, water, and land.</p> <ul style="list-style-type: none"> • interaction between air and water breaks down earth materials • pieces of earth material may be moved by air, water, wind, and gravity • pieces of earth material will settle or deposit on land or in the water in different places • soil is composed of broken-down pieces of living and nonliving earth material | |
| 2.1e | <p>Extreme natural events (floods, fires, earthquakes, volcanic eruptions, hurricanes, tornadoes, and other severe storms) may have positive or negative impacts on living things.</p> | |
| 3.1a | <p>Matter takes up space and has mass. Two objects cannot occupy the same place at the same time.</p> | |
| 3.1b | <p>Matter has properties (color, hardness, odor, sound, taste, etc.) that can be observed through the senses.</p> | |

| MAJOR UNDERSTANDINGS | | |
|----------------------|--|--|
| 3.1c | Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light. | |
| 3.1d | Measurements can be made with standard metric units and nonstandard units. (<i>Note: Exceptions to the metric system usage are found in meteorology.</i>) | |
| 3.1e | The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders. | |
| 3.1f | Objects and/or materials can be sorted or classified according to their properties. | |
| 3.1g | Some properties of an object are dependent on the conditions of the present surroundings in which the object exists. For example: <ul style="list-style-type: none"> • temperature - hot or cold • lighting - shadows, color • moisture - wet or dry | |
| 3.2a | Matter exists in three states: solid, liquid, gas. <ul style="list-style-type: none"> • solids have a definite shape and volume • liquids do not have a definite shape but have a definite volume • gases do not hold their shape or volume | |

| MAJOR UNDERSTANINGS | | |
|---------------------|---|--|
| 3.2b | Temperature can affect the state of matter of a substance. | |
| 3.2c | Changes in the properties or materials of objects can be observed and described. | |
| 4.1a | Energy exists in various forms: heat, electric, sound, chemical, mechanical, light. | |
| 4.1b | Energy can be transferred from one place to another. | |
| 4.1c | Some materials transfer energy better than others (heat and electricity). | |
| 4.1d | Energy and matter interact: water is evaporated by the Sun's heat; a bulb is lighted by means of electrical current; a musical instrument is played to produce sound; dark colors may absorb light, light colors may reflect light. | |
| 4.1e | Electricity travels in a closed circuit. | |
| 4.1f | Heat can be released in many ways, for example, by burning, rubbing (friction), or combining one substance with another. | |
| 4.1g | Interactions with forms of energy can be either helpful or harmful. | |
| 4.2a | <p>Everyday events involve one form of energy being changed to another.</p> <ul style="list-style-type: none"> • animals convert food to heat and motion • the Sun's energy warms the air and water | |

| MAJOR UNDERSTANDINGS | | |
|----------------------|---|--|
| 4.2b | <p>Humans utilize interactions between matter and energy.</p> <ul style="list-style-type: none"> • chemical to electrical, light, and heat: battery and bulb • electrical to sound (e.g., doorbell buzzer) • mechanical to sound (e.g., musical instruments, clapping) • light to electrical (e.g., solar-powered calculator) | |
| 5.1a | <p>The position of an object can be described by locating it relative to another object or the background (e.g., on top of, next to, over, under, etc.).</p> | |
| 5.1b | <p>The position or direction of motion of an object can be changed by pushing or pulling.</p> | |
| 5.1c | <p>The force of gravity pulls objects toward the center of Earth.</p> | |
| 5.1d | <p>The amount of change in the motion of an object is affected by friction.</p> | |
| 5.1e | <p>Magnetism is a force that may attract or repel certain materials.</p> | |
| 5.1f | <p>Mechanical energy may cause change in motion through the application of force and through the use of simple machines such as pulleys, levers, and inclined planes.</p> | |
| 5.2a | <p>The forces of gravity and magnetism can affect objects through gases, liquids, and solids.</p> | |
| 5.2b | <p>The force of magnetism on objects decreases as distance increases.</p> | |

MAJOR UNDERSTANDINGS: The Living Environment

| | | |
|--------------------------------|---|--|
| PERFORMANCE INDICATORS: | | |
| 1.1a | Animals need air, water, and food in order to live and thrive. | |
| 1.1b | Plants require air, water, nutrients, and light in order to live and thrive. | |
| 1.1c | Nonliving things do not live and thrive. | |
| 1.1d | Nonliving things can be human-created or naturally occurring. | |
| 1.2a | Living things grow, take in nutrients, breathe, reproduce, eliminate waste, and die. | |
| 2.1a | Some traits of living things have been inherited (e.g., color of flowers and number of limbs of animals). | |
| 2.1b | Some characteristics result from an individual's interactions with the environment and cannot be inherited by the next generation (e.g., having scars; riding a bicycle). | |
| 2.2a | Plants and animals closely resemble their parents and other individuals in their species. | |
| 2.2b | Plants and animals can transfer specific traits to their offspring when they reproduce. | |

| MAJOR UNDERSTANDINGS | |
|----------------------|---|
| 3.1a | <p>Each animal has different structures that serve different functions in growth, survival, and reproduction.</p> <ul style="list-style-type: none"> • wings, legs, or fins enable some animals to seek shelter and escape predators • the mouth, including teeth, jaws, and tongue, enables some animals to eat and drink • eyes, nose, ears, tongue, and skin of some animals enable the animals to sense their surroundings • claws, shells, spines, feathers, fur, scales, and color of body covering enable some animals to protect themselves from predators and other environmental conditions, or enable them to obtain food • some animals have parts that are used to produce sounds and smells to help the animal meet its needs • the characteristics of some animals change as seasonal conditions change (e.g., fur grows and is shed to help regulate body heat; body fat is a form of stored energy and it changes as the seasons change) |

| MAJOR UNDERSTANDINGS | | |
|----------------------|--|--|
| 3.1b | <p>Each plant has different structures that serve different functions in growth, survival, and reproduction.</p> <ul style="list-style-type: none"> • roots help support the plant and take in water and nutrients • leaves help plants utilize sunlight to make food for the plant • stems, stalks, trunks, and other similar structures provide support for the plant • some plants have flowers • flowers are reproductive structures of plants that produce fruit which contains seeds • seeds contain stored food that aids in germination and the growth of young plants | |
| 3.1c | <p>In order to survive in their environment, plants and animals must be adapted to that environment.</p> <ul style="list-style-type: none"> • seeds disperse by a plant's own mechanism and /or in a variety of ways that can include wind, water, and animals • leaf, flower, stem, and root adaptations may include variations in size, shape, thickness, color, smell, and texture • animal adaptations include coloration for warning or attraction, camouflage, defense mechanisms, movement, hibernation, and migration | |
| 3.2a | <p>Individuals within a species may compete with each other for food, mates, space, water, and shelter in their environment.</p> | |

| MAJOR UNDERSTANDINGS | | |
|----------------------|---|--|
| 3.2b | All individuals have variations, and because of these variations individuals of a species may have an advantage in surviving and reproducing. | |
| 4.1a | Plants and animals have life cycles. These may include beginning of a life, development into an adult, reproduction as an adult, and eventually death. | |
| 4.1b | Each kind of plant goes through its own stages of growth and development that may include seed, young plant, and mature plant. | |
| 4.1c | The length of time from beginning of development to death of the plant is called its life span. | |
| 4.1d | Life cycles of some plants include changes from seed to mature plant. | |
| 4.1e | Each generation of animals goes through changes in form from young to adult. This completed sequence of changes in form is called a life cycle. Some insects change from egg to larva to pupa to adult. | |
| 4.1f | Each kind of animal goes through its own stages of growth and development during its life span. | |
| 4.1g | The length of time from an animal's birth to its death is called its life span. Life spans of different animals vary. | |
| 4.2a | Growth is the process by which plants and animals increase in size. | |

| MAJOR UNDERSTANDINGS | | |
|----------------------|---|--|
| 4.2b | Food supplies the energy and materials necessary for growth and repair. | |
| 5.1a | All living things grow, take in nutrients, breathe, reproduce, and eliminate waste. | |
| 5.1b | An organism's external physical features can enable it to carry out life functions in its particular environment. | |
| 5.2a | Plants respond to changes in their environment. For example, the leaves of some green plants change position as the direction of light changes; the parts of some plants undergo seasonal changes that enable the plant to grow; seeds germinate, and leaves form and grow. | |
| 5.2b | Animals respond to change in their environment (e.g., perspiration, heart rate, breathing rate, eye blinking, shivering, and salivating). | |
| 5.2c | Senses can provide essential information (regarding danger, food, mates, etc.) to animals about their environment. | |
| 5.2d | Some animals, including humans, move from place to place to meet their needs. | |
| 5.2e | Particular animal characteristics are influenced by changing environmental conditions including: fat storage in winter, coat thickness in winter, camouflage, shedding of fur. | |

| MAJOR UNDERSTANDINGS | | |
|----------------------|--|--|
| 5.2f | Some animal behaviors are influenced by environmental conditions. These behaviors may include: nest building, hibernating, hunting, migrating, and communicating. | |
| 5.2g | The health, growth, and development of organisms are affected by environmental conditions such as the availability of food, air, water, space, shelter, heat, and sunlight. | |
| 5.3a | Humans need a variety of healthy foods, exercise, and rest in order to grow and maintain good health. | |
| 5.3b | Good health habits include hand washing and personal cleanliness; avoiding harmful substances (including alcohol, tobacco, illicit drugs); eating a balanced diet; engaging in regular exercise. | |
| 6.1a | Green plants are producers because they provide the basic food supply for themselves and animals. | |
| 6.1b | All animals depend on plants. Some animals (predators) eat other animals (prey). | |
| 6.1c | Animals that eat plants for food may in turn become food for other animals. This sequence is called a food chain. | |
| 6.1d | Decomposers are living things that play a vital role in recycling nutrients. | |

| MAJOR UNDERSTANDINGS | | |
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| 6.1e | An organism's pattern of behavior is related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and other resources, and the physical characteristics of the environment. | |
| 6.1f | When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations. | |
| 6.2a | Plants manufacture food by utilizing air, water, and energy from the Sun. | |
| 6.2b | The Sun's energy is transferred on Earth from plants to animals through the food chain. | |
| 6.2c | Heat energy from the Sun powers the water cycle (see Physical Science Key Idea 2). | |
| 7.1a | Humans depend on their natural and constructed environments. | |
| 7.1b | Over time humans have changed their environment by cultivating crops and raising animals, creating shelter, using energy, manufacturing goods, developing means of transportation, changing populations, and carrying out other activities. | |
| 7.1c | Humans, as individuals or communities, change environments in ways that can be either helpful or harmful for themselves and other organisms. | |