Los Angeles Unified School District
Division Of Instruction
Secondary Science

Integrated Science 6AB
Prerequisite: None

Course Description:
Sixth grade science course is part of the *Integrated* Learning Progression model for middle schools. The *Integrated Model* provides an opportunity for students to engage in real world phenomena, ask questions, and seek answers to those questions without regard to disciplinary boundaries. The crosscutting concepts of the Next Generation Science Standards serve as lenses for students to engage in science and engineering practices to figure out disciplinary core ideas.

In this course, grade six students use the lenses of *patterns; structure and function; systems and system models* as the cross disciplinary lenses to develop deep understanding of:

- Systems and subsystems in Earth and life science
- Earth system interactions cause weather
- Causes and effects of regional climates
- Effects of global warming on living systems

The Three Dimensions of the Next Generation Science Standards:

1. Scientific and Engineering Practices
1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

2. Disciplinary Core Ideas
LS: Life Science
LS1: From Molecules to Organisms: Structures and Processes
LS2: Ecosystems: Interactions, Energy, and Dynamics
LS3: Heredity: Inheritance and Variation of Traits
LS4: Biological Evolution: Unity and Diversity
ESS: Earth and Space Science

ESS1: Earth's Place in the Universe
ESS2: Earth's Systems
ESS3: Earth and Human Activity
PS: Physical Science
PS1: Matter and Its Interactions
PS2: Motion and Stability: Forces and Interactions
PS3: Energy
PS4: Waves and Their Applications in Technologies for Information Transfer
ETS: Engineering, Technology and the Application of Science
ETS1: Engineering Design

3. Cross Cutting Concepts

1. Patterns.
2. Cause and effect:
3. Scale, proportion, and quantity.
4. Systems and system models.
5. Energy and matter: Flows, cycles, and conservation.
6. Structure and function.
7. Stability and change.

Instructional Segment 1: Systems and Subsystems in Earth and Life Science

Preferred Integrated – Grade 6 – Instructional Segment 1: Systems and Subsystems in Earth and Life Science
Guiding Questions: What is a system? What is the value of creating a systems model? How are living systems and Earth systems similar and different?
Students who demonstrate understanding can: MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things (including Bacteria, Archaea, and Eukarya) are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells. Viruses, while not cells, have features that are both common with, and distinct from, cellular life.] MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts

of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] ***[Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]***

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] ***[Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]***

MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. ***[Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]***

MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] ***[Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]***

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] ***[Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]***

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
The bundle of performance expectations above focuses on the following elements from the NRC document A Framework for K–12 Science Education:

Highlighted Science and Engineering Practices	***High**lighted Disciplinary Core Ideas*	*Highlighted Crosscutting Concepts*
Asking Questions and Defining Problems Developing and Using Models Planning and Carrying Out Investigations Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	LS1.A: Structure and Function LS1.D: Information Processing ESS2.C: The Role of Water in Earth's Surface Processes ESS2.D: Weather and Climate ETS1.A: Defining and Delimiting Engineering Problems ETS1.B: Developing Possible Solutions	Cause and Effect Scale, Proportion, and Quantity System and System Models Energy and Matter: Flows, Cycles and Conservation Structure and Function

Highlighted California Environmental Principles and Concepts*:* *Principle II The long-term functioning and health of terrestrial, freshwater, coastal and marine ecosystems are influenced by their relationships with human societies.* *Principle III Natural systems proceed through cycles that humans depend upon, benefit from and can alter.* *Principle IV The exchange of matter between natural systems and human societies affects the long-term functioning of both.*

Instructional Segment 2: Earth System Interactions Cause Weather

Preferred Integrated – Grade 6 – Instructional Segment 2: Earth System Interactions Cause Weather
Guiding Questions: Why is the weather so different in different parts of California? How is weather related to the transfer of energy? How do models help us understand the different kinds of weather in California?
Students who demonstrate understanding can: MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] ***[Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]*** MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] ***[Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect].*** MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. * [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] ***[Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]*** MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the

environment, or the same material with different masses when a specific amount of energy is added.] ***[Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]***

MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] ***[Assessment Boundary: Assessment does not include calculations of energy.]***

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a practice or disciplinary core idea.

The bundle of performance expectations above focuses on the following elements from the NRC document A Framework for K–12 Science Education:

Highlighted Science and Engineering Practices	*Highlighted Disciplinary Core Ideas*	*Highlighted Crosscutting Concepts*
Developing and Using Models Planning and Carrying Out Investigations Analyzing and Interpreting Data	ESS2 C: The Roles of Water in Earth's Surface Processes ESS2 D: Weather and Climate PS3 A: Definitions of Energy PS3 B: Conservation of Energy and Energy Transfer	Scale, Proportion, and Quantity System and System Models Energy and Matter: Flows, Cycles, and Conservation

Constructing Explanations and Designing Solutions Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	ETS1 A: Defining and Delimiting Engineering Problems ETS1 B: Developing Possible Solutions ETS1 C: Optimizing the Design Solution	

Highlighted California Environmental Principles and Concepts:

Principle III Natural systems proceed through cycles that humans depend upon, benefit from and can alter

Principle IV The exchange of matter between natural systems and human societies affects the long-term functioning of both

Principle V Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes

Instructional Segment 3: Causes and Effects of Regional Climates

Preferred Integrated – Grade 6 – Instructional Segment 3: Causes and Effects of Regional Climates
Guiding Questions: Why is the climate so different in different regions of the planet? How do people predict the weather? Why are organisms so different in different regions of the planet? What makes organisms so similar to but also different from their parents? What makes animals behave the way they do, and how does their behavior affect their survival and reproduction?
Students who demonstrate understanding can: MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or

obtained through laboratory experiments (such as with condensation).] ***[Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]***

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] ***[Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect].***

MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] ***[Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]***

MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] ***[Assessment***

Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]

MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

[Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]

MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation].

The bundle of performance expectations above focuses on the following elements from the NRC document A Framework for K–12 Science Education:

Highlighted Science and Engineering Practices	*Highlighted Disciplinary Core Ideas*	*Highlighted Crosscutting Concepts*
Developing and Using Models Planning and Carrying out Investigations Constructing Explanations and Designing Solutions Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	LS1 B: Growth and Development of Organisms LS1 D: Information Processing LS3 A: Inheritance of Traits LS3 B: Variation of Traits ESS2 C: The Roles of Water in Earth's Surface Processes ESS2 D: Weather and Climate PS3 A: Definitions of Energy PS3 B: Conservation of Energy and Energy Transfer	*Systems and System Models* *Cause and Effect* Scale, Proportion, and Quantity

Highlighted California Environmental Principles & Concepts:

Principle II The long-term functioning and health of terrestrial, freshwater, coastal and marine ecosystems are influenced by their relationships with human societies. *Principle IV The exchange of matter between natural systems and human societies affects the long-term functioning of both.*

Instructional Segment 4: Effects of Global Warming on Living Systems

Preferred Integrated – Grade 6 – Instructional Segment 4: Effects of Global Warming on Living Systems
Guiding Questions: How do human activities affect Earth's systems? How do we know our global climate is changing?
Students who demonstrate understanding can: MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).] MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.] MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer

pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.] MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] ***[Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]*** ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. *The performance expectations marked with an asterisk integrate traditional science content with engineering through a practice or disciplinary core idea.
The bundle of performance expectations above focuses on the following elements from the NRC document *A Framework for K–12 Science Education*:

Highlighted Science and Engineering Practices	**Highlighted Disciplinary Core Ideas**	**Highlighted Crosscutting Concepts**
Asking Questions and Defining Problems Developing and Using Models Engaging in Argument from Evidence Constructing Explanations and Designing Solutions	ESS3.C: Human Impacts on Earth Systems ESS3.D: Global Climate Change LS1.B: Growth and Development of Organisms ETS1.A: Defining and Delimiting Engineering Problems	Systems and System Models Cause and Effect Stability and Change Energy and Matter: Flows, Cycles, and Conservation

Obtaining, Evaluating, and Communicating Information	ETS1.B: Developing Possible Solutions	

Highlighted California Environmental Principles & Concepts:

Principle I The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.

Principle II The long-term functioning and health of terrestrial, freshwater, coastal and marine ecosystems are influenced by their relationships with human societies.

Principle IV The exchange of matter between natural systems and human societies affects the long-term functioning of both.

***Segments were adopted from CA Science Framework - June 2016**

Texts/Materials

- Amplify – HMH Science Dimensions – SCALE Stanford
- LAUSD Secondary Science Curriculum Map
- Supplemental materials and resources

Assessment

- District Interim Assessment
- Teacher designed formative and summative assessment