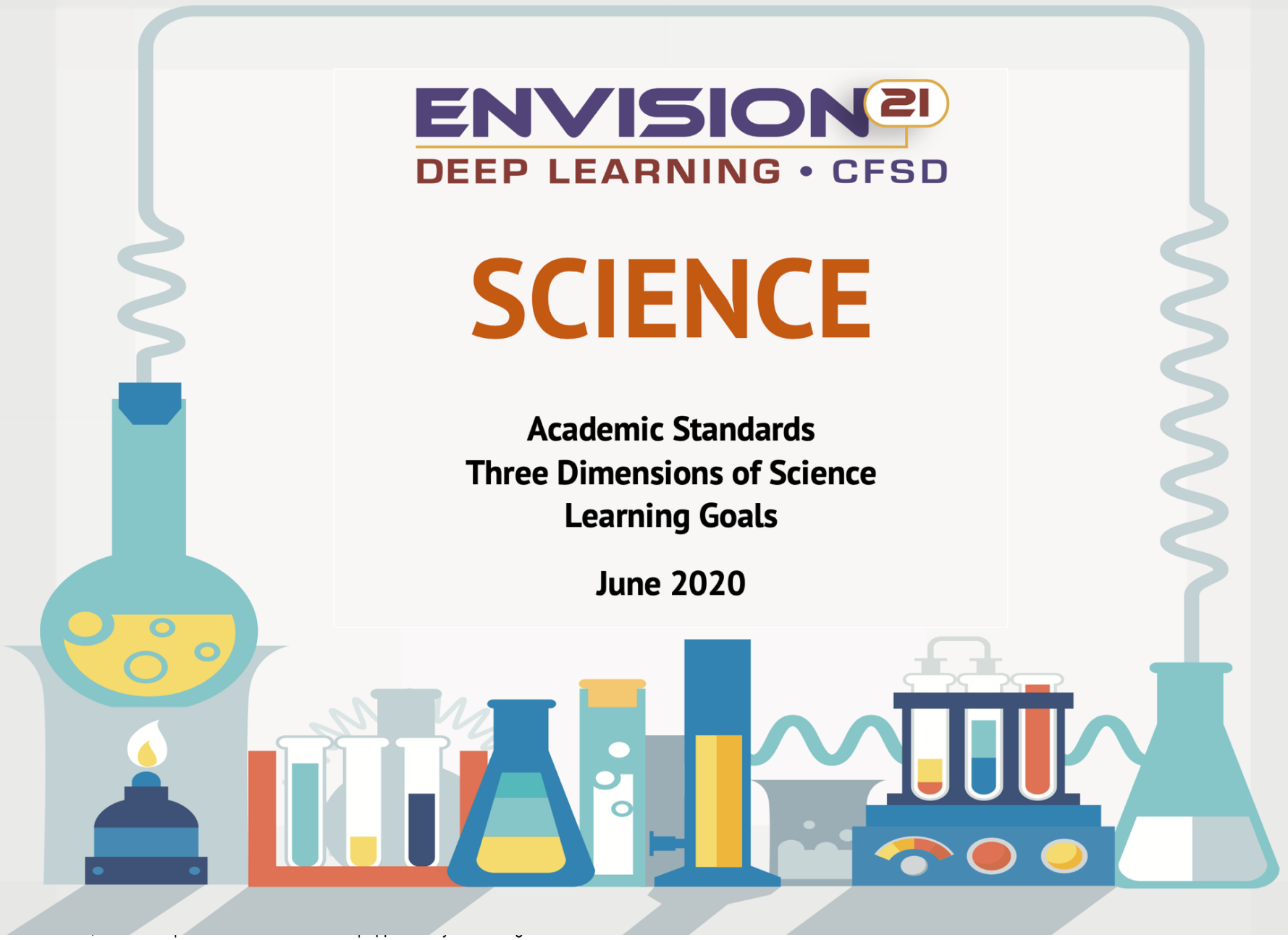
ENVISION 21

DEEP LEARNING • CFSD

SCIENCE

Academic Standards
Three Dimensions of Science
Learning Goals

June 2020



CATALINA FOOTHILLS SCHOOL DISTRICT
GRADE 5 SCIENCE STANDARDS

OVERVIEW

By the end of **fifth grade**, students apply their understanding of scale at macro (time and space) and micro (particles of matter) levels to understand patterns and scale across life, earth and space, and physical sciences. Students will develop an understanding of forces, conservation of matter, and Earth's interactive systems. Student investigations focus on collecting and making sense of observational data and simple measurements using the science and engineering practices. While individual lessons may include connections to any of the crosscutting concepts, the standards in fifth grade focus on helping students understand phenomena through the crosscutting concepts of *systems and system models, patterns, energy and matter*, and *scale, proportion, and quantity.*

PHYSICAL SCIENCE

5.P1U1.1 Plan and carry out an investigation to determine that matter has mass, takes up space, and is recognized by its observable properties; use the collected evidence to develop and support an explanation.

- With guidance, design an investigation to determine that matter has mass, takes up space, and is recognized by its observable properties:
    - Form testable questions about matter and its mass, and observable properties.
    - Based on prior knowledge, formulate a prediction in response to the testable question(s).
    - In collaboration with peers, design a procedure that will produce data in response to the testable question(s).
    - In collaboration with peers, determine how observations and/or measurements will be made in order to answer the investigative question.
- In collaboration with peers, conduct simple investigations to determine that matter has mass, takes up space, and is recognized by its observable properties:
    - Follow a procedure with precision.
    - Make observations about mass and the properties of matter.
    - Take measurements of phenomena related to mass and the properties of matter
    - Record data about mass and the properties of matter.
    - Use data from the investigation to make inferences about mass and the properties of matter.
- Develop and support an explanation:
    - Use evidence from the investigation to explain that matter has mass, takes up space, and is recognized by its observable properties.
    - Distinguish between opinions and evidence in own explanation.

5.P1U1.2 Analyze and interpret data to explain that matter of any type can be subdivided into particles too small to see and, in a closed system, if properties change or chemical reactions occur, the amount of matter stays the same.

- Analyze and interpret data (*e.g., from texts, investigations, demonstrations, models, etc.*) about matter,

its particles, and conservation of matter:
    - Ask questions about matter, its particles, and conservation of matter to frame data analysis and interpretation.
    - Collect and record data regarding the subdivision of matter into particles.
    - Collect and record data about the amount of matter before and after a chemical reaction.
    - Collect and record data about the amount of matter when its properties change.
    - Display data in tables and graphs, using digital tools when feasible, to reveal patterns and relationships.
    - Use data to evaluate relationships with regard to matter, its particles, and conservation of matter.
    - Compare data collected by different groups in order to discuss similarities and differences in their findings.
    - Interpret data to make sense of and explain the subdivision of matter, using logical reasoning, mathematics, and/or computation.
    - Interpret data to make sense of and explain the conservation of matter, using logical reasoning, mathematics, and/or computation.
- Use analysis and interpretations of data to explain that matter of any type can be subdivided into particles and that the amount of matter is conserved, regardless of changes in its properties:
    - Evaluate the claim that the amount of matter stays the same despite manipulations in its properties.
    - Describe how matter is broken down into particles too small to see.
    - Explain that the amount of matter stays the same during a closed reaction.
    - Describe the relationship between matter, its properties, and mass.

5.P1U1.3 Plan and carry out investigations to demonstrate that some substances combine to form new substances with different properties and others can be mixed without taking on new properties.

- In collaboration with peers, design investigations to explore what happens when different substances combine:
    - Design investigations to demonstrate how substances combine to create new substances with different properties than the original materials.
    - Design investigations to demonstrate how substances combine without making something new.
    - Form scientific (testable) questions based on careful observations of phenomena and information.
    - Formulate a reasonable prediction based on patterns such as cause and effect relationships.
    - Design a procedure that will produce data in response to the testable question(s).
    - Identify controlled variables.
    - Determine an appropriate number of trials for the investigation.
    - Determine how observations and/or measurements will be made in order to answer the investigative question.
- In collaboration with peers, conduct simple investigations to demonstrate how some substances combine to form new substances with different properties and others can be mixed without taking on new properties:
    - Follow a procedure with precision.
    - Make observations about combining substances.

- Collect and record appropriate data from the investigation.
- Identify patterns to make meaning of the data.
- Compare observations about the properties of different substances.

EARTH AND SPACE SCIENCES

5.E1U1.4 Plan and carry out an investigation to explore and explain the interactions between Earth's major systems and the impact on Earth's surface materials and processes.

- In collaboration with peers, design an investigation (*e.g., a simulation*) to explore the interactions between Earth's major systems:
  - Form scientific (testable) questions based on careful observations of phenomena and information.
  - Formulate a reasonable prediction based on patterns such as cause and effect relationships.
  - Design a procedure that will produce data in response to the testable question(s).
  - Identify controlled variables.
  - Determine an appropriate number of trials for the investigation.
  - Determine how observations and/or measurements will be made in order to answer the investigative question.
- In collaboration with peers, conduct a simple investigation to explore the interactions between Earth's major systems:
  - Follow a procedure with precision.
  - Make observations about interactions between Earth's major systems.
  - Collect and record appropriate data from the investigation.
  - Identify patterns to make meaning of the data.
- Explain the interactions between Earth's major systems and the impact on Earth's surface materials and processes:
  - Use data from the investigation to explain relationships between the geosphere, hydrosphere, atmosphere, and biosphere.
  - Explain how Earth's major systems affect Earth's surface materials and processes (*i.e., the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere*).

5.E1U1.5 Construct an explanation describing how the Sun is the primary source of energy impacting Earth systems.

- Use evidence *(e.g., measurements, observations, patterns from texts, media, investigations, and/or demonstrations*) to construct a scientific explanation:
  - Explain how energy impacts solid and molten rock, soil, and sediments (geosphere).
  - Explain how the Sun's energy affects the water cycle (hydrosphere).
  - Explain how the Sun's energy impacts the air (atmosphere).
  - Explain how the Sun's energy impacts living things on Earth (biosphere).
  - Describe interactions among Earth's systems: geosphere, hydrosphere, atmosphere, and biosphere.

5.E1U3.6 Construct and support an evidence-based argument about the availability of water and its impact on life.

- Construct, use, and present oral and written opinions regarding the availability of water and its impact on life:
    - State and defend a claim regarding water availability and its impact on life.
    - Construct and/or support arguments with scientific evidence, data, and/or a model.
    - Compare and refine arguments based on the strengths and weaknesses of the evidence presented.
    - Use data to describe the implications of water scarcity.

5.E2U1.7 Develop, revise, and use models based on evidence to construct explanations about the movement of the Earth and Moon within our solar system.

- Develop and revise models (*e.g., diagrams, drawings, physical replicas, dioramas, dramatizations, or storyboards*) based on evidence of the movement of the Earth and Moon within our solar system:
    - Develop evidence-based models using an analogy, example, or abstract representation to show the movement of the Earth and Moon within our solar system.
    - Use evidence from texts, media, observations, demonstrations, and/or investigations to develop models of the movement of the Earth and Moon.
    - Represent the orbits of the Earth and the Moon.
    - Represent the rotation and revolution of the Earth.
    - Compare models to identify common features and differences.
    - Use criteria to collaboratively revise models to improve their representation of the movement of the Earth and Moon within our solar system.
    - Identify limitations of models.
- Use models to construct explanations about the movement of the Earth and Moon within our solar system:
    - Use evidence from models to describe patterns of movement in the sky.
    - Use evidence from models to explain the rotation and revolution of the Earth.
    - Use evidence from models to explain the orbits of the Earth and the Moon.
    - Use evidence from models to explain the relationship between constellations and Earth's rotation.

5.E2U1.8 Obtain, analyze, and communicate evidence to support an explanation that the gravitational force of Earth on objects is directed toward the planet's center.

- Obtain and analyze evidence (*e.g., from texts, investigations, demonstrations, models, media, etc.*) about the gravitational force of Earth on objects:
    - Ask questions about Earth's gravitational force to frame the collection of evidence.
    - Compare and/or combine information across complex texts and/or other reliable media to acquire appropriate scientific and/or technical information about Earth's gravitational force.
    - Determine the main idea of a scientific text and explain how it is supported by key details; summarize the text.
    - Combine information in written text with that contained in corresponding tables, diagrams, and/or charts.
    - Use multiple sources to generate and communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts.
- Communicate evidence to support an explanation of the cause and effect relationship between the

gravitational force of Earth and the pull of objects directed toward the planet's center:

- Use multiple sources to communicate scientific information (orally and/or in written format) about the effect of mass (proportion) and distance (scale) on the gravitational attraction between objects.

LIFE SCIENCE

5.L2U1.9 Construct an explanation describing how organisms obtain resources from the environment including materials that are used again by other organisms.

- Use information from direct or indirect observations to explain how organisms obtain resources from the environment (*i.e., food, water, shelter, favorable temperature*):
  - Explain how animals use their senses to find food, water, and shelter.
  - Explain how animals use their body parts to gather, catch, eat, and chew their food.
  - Explain how plants use their body parts to obtain air, water, minerals, and sunlight.
- Use evidence to explain how animals and plants rely on each other and on Earth's materials to survive:
  - Explain how plants depend on animals (*i.e., for pollination or to move seeds around*).
  - Explain how herbivores and carnivores depend on plants (*i.e., to break down their food: herbivores eat plants directly and carnivores eat animals which have eaten plants or other animals*).

5.L2U1.10 Develop a model representing how life on Earth depends on energy from the Sun and energy from other organisms.

- Develop a simple model (*e.g., in the form of a picture, diagram, diorama, physical replica, dramatization or storyboard*) to show how life on Earth depends on energy:
  - Represent the Sun as an energy source.
  - Represent dependent relationships among plants and animals (*i.e., food web, food chain*).
  - Represent that plants make and store food (*i.e., plants with chlorophyll use sunlight to make food*).
  - Represent how animals obtain food from plants and/or other animals (*i.e., by directly eating plants and/or eating animals which have eaten plants*).
  - Compare models to identify common features and differences.

5.L2U1.11 Develop and use system models to describe the flow of energy from the Sun to and among living organisms.

- Develop system models (*e.g., diagrams, drawings, physical replicas, dioramas, dramatizations, or storyboards*) to show the flow of energy from the Sun to and among living organisms:
  - Use an analogy, example, or abstract representation to show the flow of energy from the Sun to and among living organisms.
  - Represent interrelationships and dependencies among plants and animals in an ecosystem (i.e., consumers, decomposers).
  - Represent how animals' food can be traced back to plants.
  - Represent the balance of a healthy ecosystem.
  - Represent how matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die.

    - Represent how organisms obtain gases, water, and minerals from the environment and release waste matter (gas, liquid, or solid) back into the environment.
    - Compare models to identify common features and differences.
- Use system models to describe the flow of energy from the Sun to and among living organisms:
    - Use models to describe how energy in animals' food was once energy from the Sun.
    - Use models to describe the balance of a healthy ecosystem.
    - Use models (e.g., food webs) to describe relationships among plants and animals in an ecosystem.
    - Use models to explain how matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die.
    - Use models to explain how organisms obtain gases, water, and minerals from the environment and release waste matter (gas, liquid, or solid) back into the environment.

COMPUTER SCIENCE: COMPUTATIONAL THINKING

3-5.AP.A.1 Compare, test, and refine algorithms for the same task and determine which is the most efficient.

- Select the most efficient algorithm to accomplish a task.
- Accomplish a programming task using the most efficient algorithm(s).

3-5.AP.V.1 Identify variables in applications where data is stored and modified to accomplish a task.

- Identify a count or score as variables that can be programmed to change in a digital game.

3-5.AP.C.1 Create programs that include sequences, loops, and conditionals to express ideas or solve a problem.

- Create a program to accomplish a task that requires a repeated sequence of commands (i.e., loop).
- Create a program to accomplish a task that requires execution of a portion of code when a specific condition (i.e., sensor) is true.

3-5.AP.M.1 Decompose problems into smaller, manageable subproblems to facilitate the program development process.

- Identify the steps required to solve a problem.
- Code the multiple small steps to solve a problem in order one by one.
- Create command sequences (i.e., subroutines) that can be reused or combined to accomplish a complex task.

3-5.AP.M.2 Modify, remix, or incorporate portions of an existing program into one's own work to add more advanced features.

- Make use of examples and text features on the assignment sheets to develop the subroutines for a multi-step program.
- Reuse programming sequences to accomplish new tasks.

3-5.AP.PD.1 Use an iterative process to plan the development of a program *(i.e., soliciting feedback, others' perspectives, user preferences).*

- Use command cards and diagrams to discuss and plan a program with my partner.

- Review code with partner to check for programming errors before testing.
- Make and test improvements until the program works as intended.

3-5.AP.PD.2 Observe intellectual property rights and give attribution when remixing programs or utilizing the work of others.

- Share ideas and programming strategies to facilitate learning.
- Credit others when their ideas and work is utilized.

3-5.AP.PD.3 Test and debug (identify and fix errors) a program/app or algorithm to ensure it runs as intended.

- Establish a routine to isolate and analyze errors during testing.
- Evaluate accuracy of input values (parameters).

3-5.AP.PD.4 Describe choices made during program development using code comments, presentations, and demonstrations.

- Discuss decisions throughout the process of planning, testing and refining a program with a partner.
- Use comments to document a section of code to identify and explain it to others.
- Reflect on the solutions to problems encountered and the number of trials needed to reach the programming goal.

COMPUTER SCIENCE: DATA AND ANALYSIS

3-5.DA.CVT.1a Use a digital tool to collect, organize, manipulate data.

- Collect data for an investigation using a digital tool *(i.e., table, spreadsheet, digital camera, cell phone, IPAD app or simulation).*
- Create a table to sort and compare the values in a data set.

3-5.DA.CVT.1b Present data visually through multiple representations to highlight relationships and support a claim.

- Create a visual representation of a data set using a digital tool *(e.g., graph, photo, video, slide show, simulation).*
- Use a digital tool to generate a graphical representation *(e.g., pictograph, bar graph, pie chart, line plot)* of a data set.
- Choose a graphical representation (type of graph and scale) to reveal the relationship between two variables.

3-5.DA.IM.1 Use a computational tool to make predictions, propose cause-and-effect relationships, draw conclusions, and answer questions from the data.

- Read a visual or graphical display of data to make a prediction or inference.
- Analyze a graph generated from a data set for evidence to support a claim.
- Evaluate a claim using evidence from a graphical display to draw a conclusion.
- Compare the results of a simulation to a real-world observation.