ENVISION 21

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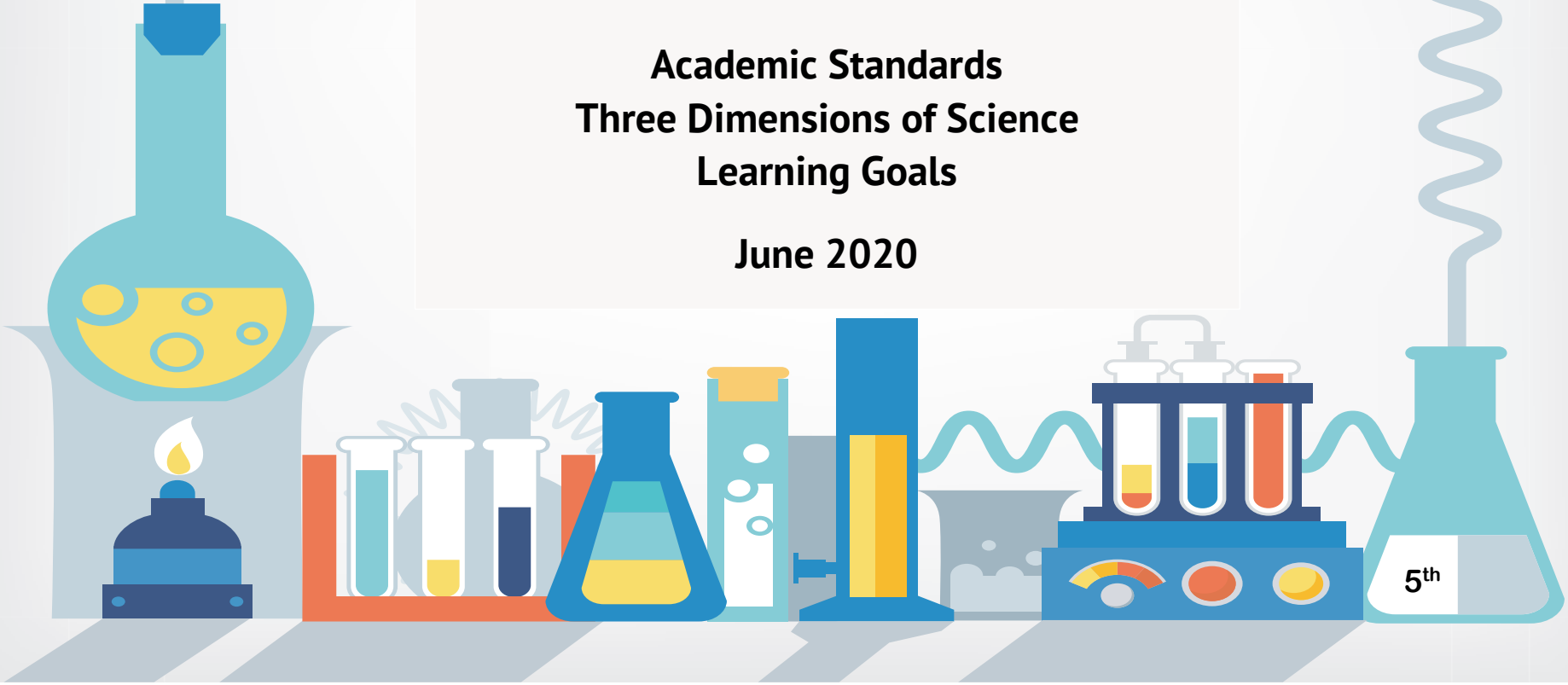
SCIENCE

Academic Standards
Three Dimensions of Science
Learning Goals

June 2020



GRADE 5

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 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 that genetic information can be passed down from parent to offspring. 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 *patterns* and *scale, proportion, and quantity.*

The fifth grade standards are grouped by area of science and topic. They are a *progression* of disciplinary core ideas. Some of the sub-ideas within the disciplinary core ideas (background information) overlap; there is not always a clear division between those ideas. Instead of focusing on distinctly different content or processes at each grade level, the standards engage students in similar topics to develop a progressively deeper understanding of each of the three science dimensions. Students continually build on and revise their knowledge and skills over time. In addition, there is a focus on a limited number of core ideas (content) both within and across the science disciplines. This was done intentionally to avoid the shallow coverage of a large number of topics, and to allow more time for teachers and students to explore each idea in greater depth.

The fifth grade standards have been organized by area of science and suggested topics. However, this does not indicate the instructional sequence or how the standards will be organized for instruction. Educators will make decisions about instructional sequence and how standards will be grouped by units for classroom instruction and assessment to best meet student needs.

	Area of Science	Title	Content
1	Physical Science	Matter	Students develop an understanding that changes can occur to matter/objects on Earth or in space, but both energy and matter follow the pattern of being conserved during those changes.
2	Physical Science	Force and Motion	Students develop an understanding that unbalanced forces cause objects to move, and that those forces have both a strength and a direction.
3	Earth and Space Sciences	Gravity in Space	Students develop an understanding of the how gravitational forces in space cause observable patterns due to the position of Earth, Sun, Moon, and stars.
4	Life Science	Genetic Traits	Students develop an understanding of patterns and how genetic information is passed from generation to generation. They also develop the understanding of how genetic information and environmental features impact the survival of an organism.
5	Computer Science	Computational Thinking & Data and Analysis	Students develop a foundation of computer science knowledge and new approaches to problem solving that capture the power of computational thinking to become both users and creators of computing technology.

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Navigating the Science Standards: Abbreviated Version

The standards serve as the basis for the design of instruction and assessment of the district's science curriculum.

- **Standards** are what a student needs to know, understand, and be able to do by the end of each grade or course. They build across grade levels in a progression of increasing understanding and through a range of cognitive demand levels.
- **Curriculum** refers to the resources used for teaching and learning the standards (units, lessons, texts, materials, tech apps, assessments, etc.).
- **Instruction** refers to the methods or methodologies used by teachers to teach their students. Instructional techniques are employed by individual teachers in response to the needs of students in their classes to help them progress through the curriculum to achieve the standards.

Grade Level or Course and **Topic Area** for standard.

Standard – What is Assessed
Describes what students should be able to do at the end of instruction to show what they have learned. Combines Science and Engineering Practices, Core Ideas, and Crosscutting Concepts.

Learning Goals
Indicators or evidence of learning at the end of a lesson or unit as aligned to the standard.

Core Ideas for Knowing and Using Science
"Understandings" or big ideas for physical, earth and space, and life sciences that build in complexity across grade levels and students develop over time.

Background Information (Content) is provided under each Core Idea

Science and Engineering Practices
Skills and knowledge that scientists and engineers engage in to either understand the world or solve a problem.

KINDERGARTEN

LIFE SCIENCE: LIVING AND NON-LIVING THINGS

Students develop an understanding that the world is comprised of living and non-living things. They investigate the relationship between structure and function in living things; plants and animals use specialized parts to help them meet their needs and survive.

Science Standard: K.L2U1.8 **Observe, ask questions, and explain the differences between the characteristics of living and non-living things.**

Learning Goals

I can:

- Based on prior experiences, ask questions about living and non-living things.
- Make direct or indirect observations about living and non-living things:
  - Identify traits of living and non-living things.
  - Record observations (*e.g., through pictures and/or words*).
  - Make inferences about the characteristics of living and non-living things.
- List the characteristics of living things (*i.e., move, reproduce, react to stimuli*).
- Use evidence to explain how the characteristics of living things differ from the characteristics of non-living things.

Core Ideas

Knowing Science

L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms.

- There is a wide variety of living things (organisms), including plants and animals. They are distinguished from non-living things by their ability to move, reproduce, and react to certain stimuli.

Using Science

U1: Scientists explain phenomena using evidence obtained from observations and/or scientific investigations. Evidence may lead to developing models and/or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

- Students ask questions to frame their exploration of living and non-living things.
- Students make observations about living and non-living things.
- Students use the evidence from their observations to make inferences about the characteristics of living and non-living things.

Science and Engineering Practices

Asking Questions and Defining Problems

- Ask questions based on observations of the natural and/or designed world.

Constructing Explanations and Designing Solutions

- Use information from direct or indirect observations to construct explanations.
- Distinguish between opinions and evidence in one's own explanations.

Crosscutting Concepts

Patterns

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s).

Systems and System Models

- Objects and organisms can be described in terms of their parts.

Life Science
Description of what students will learn for the area of science under study (K-8 only.

Three Dimensions (3-D) of Science:
The Practices, Core Ideas, and Crosscutting Concepts that were used to create the standards.

Crosscutting Concepts
Concepts that cut across all disciplines and help students deepen their understanding of core ideas.

PHYSICAL SCIENCE

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

PHYSICAL SCIENCE: MATTER

Students develop an understanding that changes can occur to matter/objects on Earth or in space, but both energy and matter follow the pattern of being conserved during those changes.

Science Standard: 5.P1U1.1 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.

Learning Goals

I can:

- 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 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.

Core Ideas

Knowing Science

P1: All matter in the Universe is made of very small particles.

- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish (e.g., sugar in solution, evaporation in a closed container). Measurements of a variety of properties (e.g., hardness, reflectivity) can be used to identify particular materials.
- At room temperature, some substances are in the solid state, some in the liquid state and some in the gas state. The state of many substances can be changed by heating or cooling them. The amount of matter does not change when a solid melts or a liquid evaporates.
- Matter of any type can be subdivided into particles that are too small to see, but even then, the matter still exists and can be detected by other means (e.g., by weighing or by its effects on other objects). For example, a model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon; the effects of air on larger particles or objects (e.g., leaves in wind, dust suspended in air); and the appearance of visible scale water droplets in condensation, fog, and, by extension, also in clouds or the contrails of a jet.

Using Science

U1: Scientists explain phenomena using evidence obtained from observations and/or scientific investigations. Evidence may lead to developing models and/or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

- Through analysis and interpretation of data, students investigate phenomena regarding physical and chemical changes in matter to build their understanding of the conservation of matter as well as the fact that matter can be subdivided into tiny particles.

Science and Engineering Practices	Crosscutting Concepts
Asking Questions and Defining Problems • Ask questions based on careful observations of phenomena and information. • Ask questions to clarify ideas or request evidence. **Analyzing and Interpreting Data** • Display data in tables and graphs, using digital tools when feasible, to reveal patterns that indicate relationships. • Use data to evaluate claims about cause and effect. • Compare data collected by different groups in order to discuss similarities and differences in their findings. • Interpret data to make sense of and explain phenomena, using logical reasoning, mathematics, and/or computation.	**Energy and Matter: Flows, Cycles, and Conservation** • Matter is made of particles. • Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. **Stability and Change** • Change is measured in terms of differences over time and may occur at different rates. **Scale, Proportion, and Quantity** • Natural objects and/or observable phenomena exist from the very small to the immensely large, or from very short to very long periods of time.

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

PHYSICAL SCIENCE: MATTER

Students develop an understanding that changes can occur to matter/objects on Earth or in space, but both energy and matter follow the pattern of being conserved during those changes.

Science Standard: 5.P1U1.2 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.

Learning Goals

I can:

- 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.

Core Ideas

Knowing Science

P1: All matter in the Universe is made of very small particles.

- When two or more different substances are mixed, a new substance with different properties may be formed; such occurrences depend on the substances and the temperature. No matter what reaction or change in properties occurs, the total weight of the substances does not change. Other substances simply mix without changing permanently and can often be separated again. At room temperature, some substances are in the solid state, some in the liquid state and some in the gas state. The state of many substances can be changed by heating or cooling them. The amount of matter does not change when a solid melts or a liquid evaporates.

Using Science

U1: Scientists explain phenomena using evidence obtained from observations and/or scientific investigations. Evidence may lead to developing models and/or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

- Students design and carry out investigations to explore what happens when substances combine. These investigations help students develop their understanding of mixtures and solutions. They can revise their thinking as they carry out multiple investigations.

Science and Engineering Practices	Crosscutting Concepts
Planning and Carrying Out Investigations • Design and conduct investigations collaboratively, using fair tests in which variables are controlled and the number of trials considered. • Evaluate appropriate methods and tools for collecting data. • Make observations and/or measurements, collect appropriate data, and identify patterns that provide evidence for an explanation of a phenomenon or test a design solution.	**Energy and Matter: Flows, Cycles, and Conservation** • Matter is made of particles. • Energy Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. • Energy can be transferred in various ways and between objects. **Scale, Proportion, and Quantity** • Natural objects and/or observable phenomena exist from the very small to the immensely large, or from very short to very long periods of time.

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

PHYSICAL SCIENCE: FORCE AND MOTION

Students develop an understanding that changes can occur to matter/objects on Earth or in space, but both energy and matter follow the pattern of being conserved during those changes.

Science Standard: 5.P2U1.3 Construct an explanation using evidence to demonstrate that objects can affect other objects even when they are not touching.

Learning Goals

I can:

- Construct an explanation using observed quantitative relationships (*e.g., relationships between mass and speed; how fast or far objects move in response to forces*).
- Use evidence *(e.g., measurements, observations, patterns)* to demonstrate the effects of forces between objects in contact *(e.g., friction, elastic pushes and pulls, etc.).*
- Use evidence *(e.g., from investigations, demonstrations, texts, media, and/or models)* to demonstrate the effects of forces between objects at a distance *(i.e., electric, gravitational, and magnetic).*
- Select evidence to support particular points in the explanation.
- Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.

Core Ideas

Knowing Science

P2: Objects can affect other objects at a distance.

- Gravity is the universal attraction between all objects, however large or small, although it is only apparent when one of the objects is very large. This gravitational attraction keeps the planets in orbit around the Sun, the Moon round the Earth and their moons round other planets. On the Earth it results in everything being pulled down towards the center of the Earth. We call this downward attraction the weight of an object. Objects in contact exert forces on each other (friction, elastic pushes and pulls). Electric, magnetic, and gravitational forces between a pair of objects do not require that the objects be in contact-for example, magnets push pull at a distance.

Using Science

U1: Scientists explain phenomena using evidence obtained from observations and/or scientific investigations. Evidence may lead to developing models and/or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

- Students use evidence to develop their understanding of phenomena about different kinds of forces and their effect on objects. They construct explanations that demonstrate cause and effect relationships among objects at a distance.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

- Construct explanations of observed quantitative relationships (e.g., the distribution of plants in the backyard).
- Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or design a solution to a problem.
- Identify the evidence that supports particular points in an explanation.
- Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.

Crosscutting Concepts

Cause and Effect: Mechanism and Prediction

- Cause and effect relationships are routinely identified, tested, and used to explain change.
- Events that occur together with regularity might or might not be a cause and effect relationship.

Scale, Proportion, and Quantity

- Natural objects and/or observable phenomena exist from the very small to the immensely large, or from very short to very long periods of time.

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

PHYSICAL SCIENCE: FORCE AND MOTION

Students develop an understanding that unbalanced forces cause objects to move, and that those forces have both a strength and a direction.

Science Standard: 5.P3U1.4 Obtain, analyze, and communicate evidence of the effects that balanced and unbalanced forces have on the motion of objects.

Learning Goals

I can:

- Obtain and analyze evidence *(e.g., from texts, investigations, demonstrations, models, media, etc.)* of the effects that balanced and unbalanced forces have on the motion of objects:
  - Ask questions about the effects of forces on the motion of objects 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 the effects of forces on the motion of objects.
  - 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 scientific and/or technical information, including various forms of media and may include tables, diagrams, and charts.
  - Use data to identify patterns of an object's motion in various situations.
- Communicate evidence of the effects that balanced and unbalanced forces have on the motion of objects:
  - Use multiple sources to communicate scientific information orally and/or in written formats, including various forms of media.

Core Ideas

Knowing Science

P3: Changing the movement of an object requires a net force to be acting on it.

- Each force acts on one particular object and has both a strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion.
- The patterns of an object's motion in various situations can be observed and measured; when past motion exhibits a regular pattern, future motion can be predicted from it.

Using Science

U1: Scientists explain phenomena using evidence obtained from observations and/or scientific investigations. Evidence may lead to developing models and/or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

- Students explore the effects of balanced and imbalanced forces on the motion of objects by examining evidence from a variety of sources.

Science and Engineering Practices

Obtaining, Evaluating, and Communicating Information

- Compare and/or combine across complex texts and/or other reliable media to acquire appropriate scientific and/or technical information.
- 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.

Crosscutting Concepts

Stability and Change

- Change is measured in terms of differences over time and may occur at different rates.

Cause and Effect: Mechanism and Prediction

- Cause and effect relationships are routinely identified, tested, and used to explain change.

• 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. • Use models to share findings or solutions in oral and/or written presentations, and/or extended discussions. **Asking Questions and Defining Problems** • Ask questions based on careful observations of phenomena and information. • Ask questions to clarify ideas or request evidence.	• Events that occur together with regularity might or might not be a cause and effect relationship. **Patterns** • Patterns of change can be used to make predictions.

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

PHYSICAL SCIENCE: FORCE AND MOTION

Students develop an understanding that changes can occur to matter/objects on Earth or in space, but both energy and matter follow the pattern of being conserved during those changes.

Science Standard: 5.P3U2.5 Define problems and design solutions pertaining to force and motion.

Learning Goals

I can:

- Define problems pertaining to force and motion:
  - Use prior knowledge to describe solvable problems pertaining to force and motion.
  - Ask questions to clarify the constraints of solutions to a problem.
  - Define the design problem by establishing several criteria for success and constraints on materials, time, or cost.
- Design solutions to problems pertaining to force and motion:
  - Use tools and materials to develop multiple designs that meet the established criteria and constraints.
  - Communicate designs through sketches, drawings, and/or physical models.
  - Apply scientific knowledge about force and motion to design solutions.
  - Generate and compare multiple solutions to the problem based on how well they meet the criteria and constraints of the problem.

Core Ideas

Knowing Science

P3: Changing the movement of an object requires a net force to be acting on it.

- How quickly an object's motion is changed depends on the force acting and the object's mass. The greater the mass of an object, the longer it takes to speed it up or slow it down, a property of mass described as inertia.

Using Science

U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products.

- Students use their understanding of forces to identify problems and formulate solutions pertaining to force and motion.

Science and Engineering Practices

Asking Questions and Defining Problems

- Ask questions based on careful observations of phenomena and information.
- Use prior knowledge to describe problems that can be solved.
- Define a simple design problem that can be solved through the development of an object, tool or process and includes several criteria for success and constraints on materials, time, or cost.

Constructing Explanations and Designing Solutions

- Apply scientific knowledge to solve design problems.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the problem.

Crosscutting Concepts

Energy and Matter: Flows, Cycles, and Conservation

- Energy can be transferred in various ways and between objects.

Cause and Effect: Mechanism and Prediction

- Cause and effect relationships are routinely identified, tested, and used to explain change.

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

PHYSICAL SCIENCE: FORCE AND MOTION

Students develop an understanding that changes can occur to matter/objects on Earth or in space, but both energy and matter follow the pattern of being conserved during those changes.

Science Standard: 5.P4U1.6 Analyze and interpret data to determine how and where energy is transferred when objects move.

Learning Goals

I can:

- Analyze and interpret data *(e.g., from texts, investigations, demonstrations, models, etc.)* about how and where energy is transferred when objects move:
  - Ask questions about energy transfer to frame the data analysis and interpretation.
  - Organize data into meaningful categories regarding energy transfer through sound, light, heat, and electric currents.
  - Organize data into meaningful categories regarding changes in energy that occur when objects collide.
  - Display data in tables and graphs, using digital tools when feasible, to reveal patterns and relationships.
  - Use data to evaluate relationships between energy transfer and motion.
  - Compare data collected by different groups in order to discuss similarities and differences in their findings.
  - Interpret data to make sense of how and where energy is transferred through sound, light, heat, and electric currents.
  - Interpret data to make sense of changes in energy that occur when objects collide.

Core Ideas

Knowing Science

P4: The total amount of energy in a closed system is always the same but can be transferred from one energy store to another during an event.

- The faster a given object is moving, the more energy it possesses. Energy can be moved from place to place by moving objects or through sound, light, or electric currents. Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.
- Light also transfers energy from place to place. For example, energy radiated from the sun is transferred to Earth by light. When this light is absorbed, it warms Earth's land, air, and water and facilitates plant growth. Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy (e.g., moving water driving a spinning turbine which generates electric currents).

Using Science

U1: Scientists explain phenomena using evidence obtained from observations and/or scientific investigations. Evidence may lead to developing models and/or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

- Students explore data to determine relationships between energy transfer and movement. Data must be organized and displayed in order for it to be meaningful in building student understanding of the conservation of energy.

Science and Engineering Practices	Crosscutting Concepts
Asking Questions and Defining Problems • Ask questions based on careful observations of phenomena and information.	**Energy and Matter: Flows, Cycles, and Conservation** • Energy can be transferred in various ways and between objects.

• Use Ask questions to clarify ideas or request evidence. **Analyzing and Interpreting Data** • Display data in tables and graphs, using digital tools when feasible, to reveal patterns that indicate relationships. • Use data to evaluate claims about cause and effect. • Compare data collected by different groups in order to discuss similarities and differences in their findings. • Interpret data to make sense of and explain phenomena, using logical reasoning, mathematics, and/or computation.	**Patterns** • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation. **Cause and Effect: Mechanism and Prediction** • Cause and effect relationships are routinely identified, tested, and used to explain change.

EARTH AND SPACE SCIENCES

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

EARTH AND SPACE SCIENCES: GRAVITY IN SPACE

Students develop an understanding of the how gravitational forces in space cause observable patterns due to the position of Earth, Sun, Moon, and stars.

Science Standard: 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.

Learning Goals

I can:

- 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.

Core Ideas

Knowing Science

E2: The Earth and our solar system are a very small part of one of many galaxies within the Universe.

- The Earth moves round the Sun taking about a year for one orbit. The Moon orbits the Earth taking about four weeks to complete an orbit. The Sun, at the center of the solar system, is the only object in the solar system that is a source of visible light. The Moon reflects light from the Sun and as it moves round the Earth only those parts illuminated by the Sun are seen.
- The Earth rotates about an axis lying north to south and this motion makes it appear that the Sun, Moon and stars are moving round the Earth. The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. Some objects in the solar system can be seen with the naked eye. Planets in the night sky change positions and are not always visible from Earth as they orbit the sun. Stars appear in patterns called constellations, which can be used for navigation and appear to move together across the sky because of Earth's rotation.

Using Science

U1: Scientists explain phenomena using evidence obtained from observations and/or scientific investigations. Evidence may lead to developing models and/or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

- Students use scientific evidence to make sense of the movement of objects in the sky. Students develop models to better understand and explain patterns of movement of the Earth and Moon within our solar system.

Science and Engineering Practices	Crosscutting Concepts
Developing and Using Models • Develop and revise models collaboratively to measure and explain frequent and regular events. • Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution. • Use simple models to describe or support explanations for phenomena and test cause and effect relationships or interactions concerning the functioning of a natural or designed system. • Identify limitations of models. **Constructing Explanations and Designing Solutions** • Construct explanations of observed quantitative relationships (e.g., the distribution of plants in the backyard). • Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or design a solution to a problem. • Identify the evidence that supports particular points in an explanation. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.	**Patterns** • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation. **Systems & System Models** • A system can be described in terms of its components and their interactions. **Stability and Change** • Change is measured in terms of differences over time and may occur at different rates • Some systems appear stable, but over long periods of time will eventually change.

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

EARTH AND SPACE SCIENCES: GRAVITY IN SPACE

Students develop an understanding of the how gravitational forces in space cause observable patterns due to the position of Earth, Sun, Moon, and stars.

Science Standard: 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.

Learning Goals

I can:

- 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.

Core Ideas

Knowing Science

E2: The Earth and our solar system are a very small part of one of many galaxies within the Universe.

- Gravity is the universal attraction between all objects, however large or small, although it is only apparent when one of the objects is very large. On the Earth it results in everything being pulled down towards the center of the Earth. We call this downward attraction the weight of an object. The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.

Using Science

U1: Scientists explain phenomena using evidence obtained from observations and/or scientific investigations. Evidence may lead to developing models and/or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

- Students analyze evidence from different sources to develop their understanding of Earth's gravitational force.

Science and Engineering Practices	Crosscutting Concepts
Asking Questions and Defining Problems • Ask questions based on careful observations of phenomena and information. **Obtaining, Evaluating, and Communicating Information** • Compare and/or combine across complex texts and/or other reliable media to acquire appropriate scientific and/or technical information.	**Cause and Effect: Mechanism and Prediction** • Cause and effect relationships are routinely identified, tested, and used to explain change. • Events that occur together with regularity might or might not be a cause and effect relationship.

• 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. • Use models to share findings or solutions in oral and/or written presentations, and/or extended discussions.	**Patterns** • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation. **Scale, Proportion, and Quantity** • Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.

LIFE SCIENCE

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

LIFE SCIENCE: GENETIC TRAITS

Students develop an understanding of patterns and how genetic information is passed from generation to generation. They also develop the understanding of how genetic information and environmental features impact the survival of an organism.

Science Standard: 5.L3U1.9 Obtain, evaluate, and communicate information about patterns between the offspring of plants, and the offspring of animals (including humans); construct an explanation of how genetic information is passed from one generation to the next.

Learning Goals

I can:

- Obtain and evaluate information (*e.g., from texts, investigations, demonstrations, models, media, etc.*) about patterns between the offspring of plants, and the offspring of animals (including humans):
  - Ask questions to frame the collection of information about patterns in plant and animal offspring.
  - Compare and/or combine information across complex texts and/or other reliable media to acquire appropriate scientific and/or technical information about plant and animal offspring.
  - 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 scientific and/or technical information, including various forms of media and may include tables, diagrams, and charts.
  - Use data to make predictions based on patterns of traits in plants and animals.
- Communicate information about patterns between the offspring of plants, and the offspring of animals (including humans):
  - Use multiple sources to communicate scientific information orally and/or in written formats, including various forms of media.
- Construct an explanation of how genetic information is passed from one generation to the next:
  - Use evidence to explain that a mix of traits is inherited through parents from one generation to the next.
  - Use evidence to explain variations in physical traits and functions among offspring from the same parents.

Core Ideas

Knowing Science

L3: Genetic information is passed down from one generation of organisms to another.

- Many characteristics of organisms are inherited from their parents. Offspring acquire a mix of traits from their biological parents. Different organisms vary in how they look and function because they have different inherited information.
- In each kind of organism there is variation in the traits themselves, and different kinds of organisms may have different versions of the trait.

Using Science

U1: Scientists explain phenomena using evidence obtained from observations and/or scientific investigations. Evidence may lead to developing models and/or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

- Students explore information about genetic inheritance in plants and animals to make sense of similarities and differences in their physical traits and functions.

Science and Engineering Practices	Crosscutting Concepts
Asking Questions and Defining Problems • Ask questions based on careful observations of phenomena and information.	**Patterns** • Patterns of change can be used to make predictions.

Obtaining, Evaluating, and Communicating Information • Compare and/or combine across complex texts and/or other reliable media to acquire appropriate scientific and/or technical information. • 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. • Use models to share findings or solutions in oral and/or written presentations, and/or extended discussions. **Constructing Explanations and Designing Solutions** • Construct explanations of observed quantitative relationships (e.g., the distribution of plants in the backyard). • Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or design a solution to a problem. • Identify the evidence that supports particular points in an explanation. • Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.	• Patterns can be used as evidence to support an explanation. **Cause and Effect: Mechanism and Prediction** • Cause and effect relationships are routinely identified, tested, and used to explain change. • Events that occur together with regularity might or might not be a cause and effect relationship.

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

LIFE SCIENCE: GENETIC TRAITS

Students develop an understanding of patterns and how genetic information is passed from generation to generation. They also develop the understanding of how genetic information and environmental features impact the survival of an organism.

Science Standard: 5.L3U1.10 Construct an explanation based on evidence that the changes in an environment can affect the development of the traits in a population of organisms.

Learning Goals

I can:

- Use evidence *(e.g., measurements, observations, patterns)* to explain the relationship between changes in the environment and the traits a population of organisms develops.
- Use evidence *(e.g., from investigations, demonstrations, texts, media, and/or models)* to explain how interactions with the environment (*i.e., diet, temperature, learning, resources*) can affect traits in a population of organisms.
- Use evidence to explain how changes in the environment can lead organisms to survive and reproduce, move to new locations, or die.
- Use evidence to explain the relationship between an organism's genetics and changes in its environment in the development of the organism's traits.
- Use evidence to compare behaviors and physical traits of related organisms that live in different environments.
- Select evidence to support particular points in the explanation.
- Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.

Core Ideas

Knowing Science

L3: Genetic information is passed down from one generation of organisms to another.

- The environment affects the traits that an organism develops— differences in where they grow or in the food they consume may cause organisms that are related to end up looking or behaving differently.
- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.

Using Science

U1: Scientists explain phenomena using evidence obtained from observations and/or scientific investigations. Evidence may lead to developing models and/or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

- Students seek to understand how organisms that are related may end up looking or behaving differently. Students use evidence to construct and support explanations about the relationship between an organism's environment and its physical appearance and behavioral traits.

Science and Engineering Practices

Constructing Explanations and Designing Solutions

- Construct explanations of observed quantitative relationships (e.g., the distribution of plants in the backyard).
- Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or design a solution to a problem.
- Identify the evidence that supports particular points in an explanation.

Crosscutting Concepts

Patterns

- Patterns of change can be used to make predictions.
- Patterns can be used as evidence to support an explanation.

Cause and Effect: Mechanism and Prediction

- Cause and effect relationships are routinely identified, tested, and used to explain

• Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation.	change. • Events that occur together with regularity might or might not be a cause and effect relationship. **Stability and Change** • Change is measured in terms of differences over time and may occur at different rates. • Some systems appear stable, but over long periods of time will eventually change.

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

LIFE SCIENCE: GENETIC TRAITS

Students develop an understanding of patterns and how genetic information is passed from generation to generation. They also develop the understanding of how genetic information and environmental features impact the survival of an organism.

Science Standard: 5.L4U3.11 Obtain, evaluate, and communicate evidence about how natural and human-caused changes to habitats or climate can impact populations.

Learning Goals

I can:

- Obtain and evaluate evidence (*e.g., from texts, investigations, demonstrations, models, media, etc.*) about how natural and human-caused changes to habitats of climate can impact populations:
  - Ask questions to frame the collection of evidence regarding changes to habitats or climate and their impact on populations.
  - Compare and/or combine information across complex texts and/or other reliable media to acquire appropriate scientific and/or technical information about how changes to habitats or climate can impact populations.
  - 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 evidence to determine how changes to climate or habitats can impact populations.
  - Use evidence to determine the impact of human-caused changes to populations.
- Communicate evidence about how natural and human-caused changes to habitats or climate can impact populations:
  - Use multiple sources to communicate scientific information orally and/or in written formats, including various forms of media.

Core Ideas

Knowing Science

L4: The unity and diversity of organisms, living and extinct, is the result of evolution.

- Changes in an organism's habitat are sometimes beneficial to it and sometimes harmful. For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.
- Scientists have identified and classified many plants and animals. Populations of organisms live in a variety of habitats and change in those habitats affects the organisms living there. Humans, like all other organisms, obtain living and nonliving resources from their environments.

Using Science

U3: Applications of science often have both positive and negative ethical, social, economic, and/or political implications.

- Discussions of human influences on climate or habitats engage students in various positive and negative ethical, social, economic, and/or political implications. When examining this issue from various perspectives, it is important for students to evaluate arguments and evidence.

Science and Engineering Practices	Crosscutting Concepts
Asking Questions and Defining Problems • Ask questions based on careful observations of phenomena and information. **Obtaining, Evaluating, and Communicating information**	**Cause and Effect: Mechanism and Prediction** • Cause and effect relationships are routinely identified, tested, and used to explain change.

• Compare and/or combine across complex texts and/or other reliable media to acquire appropriate scientific and/or technical information. • 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. • Use models to share findings or solutions in oral and/or written presentations, and/or extended discussions.	• Events that occur together with regularity might or might not be a cause and effect relationship. **Stability and Change** • Change is measured in terms of differences over time and may occur at different rates. • Some systems appear stable, but over long periods of time will eventually change.

CATALINA FOOTHILLS SCHOOL DISTRICT

GRADE 5 SCIENCE STANDARD

LIFE SCIENCE: GENETIC TRAITS

Students develop an understanding of patterns and how genetic information is passed from generation to generation. They also develop the understanding of how genetic information and environmental features impact the survival of an organism.

Science Standard: 5.L4U3.12 Use evidence to prove that inherited characteristics can be affected by behavior and/or environmental conditions.

Learning Goals

I can:

- Describe the effects of behavior and/or environmental conditions (*e.g., food, exercise, temperature, water, light, etc.*) on inherited characteristics (*e.g., pigmentation, size, shape, etc.*).
- Use scientific evidence, data, and/or models to construct and support explanations of the relationship between inherited characteristics and behavior and/or environmental conditions.
- Compare and refine explanations based on the strengths and weaknesses of the evidence presented.

Core Ideas

Knowing Science

L4: The unity and diversity of organisms, living and extinct, is the result of evolution.

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.
- Many characteristics of organisms are inherited from their parents. Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.

Using Science

U3: Applications of science often have both positive and negative ethical, social, economic, and/or political implications.

- There are many perspectives about the degree to which an organism is affected by genetics, behavior, and their environment. Students use evidence to explore the interactions between genetics and the environment and an organism's behavior.

Science and Engineering Practices

Engaging in Argument from Evidence

- Construct and/or support scientific arguments with evidence, data, and/or a model.
- Compare and refine arguments based on the strengths and weaknesses of the evidence presented.
- Respectfully provide and receive critiques on scientific arguments with peers by citing relevant evidence and posing specific questions.

Crosscutting Concepts

Cause and Effect: Mechanism and Prediction

- Cause and effect relationships are routinely identified, tested, and used to explain change.
- Events that occur together with regularity might or might not be a cause and effect relationship.

Stability and Change

- Change is measured in terms of differences over time and may occur at different rates.
- Some systems appear stable, but over long periods of time will eventually change.

COMPUTER SCIENCE

(Note: The Computer Science Standards will be taught by the STEM Integration Specialist in collaboration with the classroom teachers.)

CATALINA FOOTHILLS SCHOOL DISTRICT

COMPUTER SCIENCE STANDARDS FOR GRADES 3-5

CONCEPT: COMPUTATIONAL THINKING

Concept: Computational Thinking (Algorithms and Programming)

Subconcepts:

- **Algorithms (A)**
- **Variables (V)**
- **Control (C)**
- **Modularity (M)**
- **Program Development (PD)**

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

Learning Goals

I can:

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

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

Learning Goals

I can:

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

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

Learning Goals

I can:

- 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.

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

Learning Goals

I can:

- 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.

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

Learning Goals

I can:

- 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.

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

Learning Goals

I can:

- 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.

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

Learning Goal

I can:

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

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

Learning Goal

I can:

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

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

Learning Goal

I can:

- 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 Practices

Fostering an Inclusive Computing Culture

- Build an inclusive and diverse computing culture using strategies that incorporate perspectives from people of different genders, ethnicities, and abilities.

Collaborating Around Computing

- Collaborate around computing by working in pairs and on teams to perform a computational task, asking for the contributions and feedback of others to improve outcomes.

Recognizing and Defining Computational Problems

- Recognize and define computational problems, break them down into parts, and evaluate each part to determine whether a computational solution is appropriate.

Developing and Using Abstractions

- Identify patterns and extract common features from specific examples to create generalizations from abstractions.

Creating Computational Artifacts

- Create computational artifacts that embrace both creative expression and the exploration of ideas to create prototypes and solve computational problems. Create artifacts that are personally relevant or beneficial to the community and beyond.

Testing and Refining Computational Artifacts

- Test and refine computational artifacts using a deliberate and iterative process for improving a computational artifact.

Communicating About Computing

- Communicate clearly with others about the use and effects of computation and computational choices, and to exchange ideas with others.

Science and Engineering Practices	Crosscutting Concepts
Asking Questions and Defining Problems • Ask questions to clarify the constraints of solutions to a problem. **Developing and Using Models** • Develop a diagram or simple physical prototype to convey a proposed object, tool or process. **Analyzing and Interpreting Data** • Use data to evaluate and refine design solutions. **Obtaining, Evaluating, and Communicating Information** • Critique and/or communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers.	**Cause and Effect: Mechanism and Prediction** • Cause and effect relationships are routinely identified, tested, and used to explain change. **Systems and System Models** • A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. • A system can be described in terms of its components and their interactions.

CATALINA FOOTHILLS SCHOOL DISTRICT

COMPUTER SCIENCE STANDARDS FOR GRADES 3-5

CONCEPT: DATA AND ANALYSIS

Concept: Data and Analysis

Subconcepts:

- **Collection, Visualization, and Transformation (CVT)**
- **Inference and Models (M)**

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

Learning Goals

I can:

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

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

Learning Goals

I can:

- Create a visual representation of a data set using a digital tool (graph, photo, video, slide show, simulation).
- Use a digital tool to generate a graphical representation (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.

Computer Science Standard: 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.

Learning Goals

I can:

- 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.

Computer Science Practices

Fostering an Inclusive Computing Culture

- Build an inclusive and diverse computing culture using strategies that incorporate perspectives from people of different genders, ethnicities, and abilities.

Collaborating Around Computing

- Collaborate around computing by working in pairs and on teams to perform a computational task, asking for the contributions and feedback of others to improve outcomes.

Recognizing and Defining Computational Problems

- Recognize and define computational problems, break them down into parts, and evaluate each part to determine whether a computational solution is appropriate.

Developing and Using Abstractions

- Identify patterns and extract common features from specific examples to create generalizations from abstractions.

Creating Computational Artifacts

- Create computational artifacts that embrace both creative expression and the exploration of ideas to create prototypes and solve computational problems. Create artifacts that are personally relevant or beneficial to the community and beyond.

Testing and Refining Computational Artifacts

- Test and refine computational artifacts using a deliberate and iterative process for improving a computational artifact.

Communicating About Computing

- Communicate clearly with others about the use and effects of computation and computational choices, and to exchange ideas with others.

Science and Engineering Practices	Crosscutting Concepts
Planning and Carrying Out Investigations • Evaluate appropriate methods and tools for collecting data. **Analyzing and Interpreting Data** • Use data to evaluate and refine design solutions. **Using Mathematics and Computational Thinking** • Organize simple data sets to reveal patterns that suggest relationships. **Constructing Explanations and Designing Solutions** • Use evidence (e.g., measurements, observations, patterns) to construct a scientific explanation or design a solution to a problem. • Identify the evidence that supports particular points in an explanation.	**Patterns** • Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products. • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation **Cause and Effect: Mechanism and Prediction** • Cause and effect relationships are routinely identified, tested, and used to explain change.