Walking Through Strand Articulation

We start science planning from the California Science Standards because they provide a helpful guide for exploring the wide range of teaching possibilities. Kids are curious about everything around them – it's all science! The science standards provide a structure of basic science concepts, sequenced so the concepts build on each other across grades, which can help you focus the enormous world of interesting things to explore into manageable chunks. The standards also make it easier for your students to move into or on from your school. Even if you decide to modify the structure, having a common understanding of how subjects articulate between grades is essential if you want to avoid missing major ideas or repeating experiences between grades.

Earth Science

K: Observing and naming are a focus across all strands in K. This is an intro to ES: look up and down and at the things we use – landforms (identifying mountains, oceans, streams), weather changes and seasons, and connecting what we use every day to earth's products – simple conservation, don't waste.

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Landforms Notice Weather changes & Seasons Resource use & simple conservation

1: Developing observation skills with a focus on weather. Measuring and describing weather with tools and #; and then predicting seasonal weather trends. Observing heat from sun as it warms different surfaces. (can be connected to needs of plants in LS and heating section of PS) All prep for 5th weather.

Measure Weather – tools, numbers Predictable Seasonal Trends Sun warms land, air, water

2: Look more closely at materials that make up the earth's surface (different rocks, turning into small rocks and sand, adding organic matl to make soil, evidence of past life -fossils) Look closer at resource use: what do we use from the earth to meet our need for food, fuel, shelter (builds on and reinforces idea of needs of LT from 1st grade LS).

Introduction to Rocks Rocks to Gravel to Soil Comparing Different Soils Fossils evidence of old life Earth's resources help us meet our needs

Later grades move into thinking more about what we observe.

3: Identifying regular, predictable patterns of movement in objects we see in the sky (moon, sun, stars). Shows what we can understand about the earth as a planet by observing the sky. All these things: changes in stars, position of sun, phases of the moon, differences between stars and planets with telescope, reveals nature of our planetary system: planets orbiting stars.

Star Patterns & Movement Moon Phases Telescopes as tools Orbits of Earth, Sun, Moon, other planets Changing Position of Sun

4: **Why** are there different materials on earth's surface - Different ways basic material – rocks - are made. Connecting the properties of rocks to the processes that made them. **Using** diagnostic property table to identify rocks and common minerals. How fast processes (erosion, volcano, earthquake) and slow processes (root growth, weathering, deposition) are constantly changing earth's surface and materials.

Rock Cycle Properties as Diagnostic Tool Processes that change surface – erosion, volcano, earthquake, water

5: The "Why" behind earlier observations about water resources, weather, and objects in the sky:

- why is water limited? what is its relation to the weather, the water cycle?
- what causes weather? predicting and understanding the relation to atmosphere, ocean, wind
- what is the solar system? Why do planets orbit larger bodies? Sun, Gravitational attraction

Begin looking at systems : Also a fun math/scale connection between PS (atoms) and ES (solar systems)

Water Cycle and Limitations Water cycle Water distribution Your water supply Weather Winds, convection currents Oceans' role Severe weather Predicting the weather Atmospheric Pressure Holding the Solar System Together Sun, Size and characteristics Solar system parts

Life Science

K: Observing and naming. Observe differences between living things and similarities of major groups. Learning vocabulary for major external structures of animals and plants. Making distinction between what we observe and what we imagine in stories.

Describe differences in LT (living things) Similarities of major groups Observation vs Imagination Name major parts/structures

1: Needs of living things, for shelter, food or energy sources, water, air. Noticing the diversity of LT in different places and how major structures of plants and animals help them meet their needs in these different habitats. And specifically the different roles of teeth, roots, leaves in gathering energy.

Diversity and Habitat Needs of LT How structures help LT meet needs Role of teeth, roots, leaves to gather energy

2: Answers why LT look the way they do. How plants and animals inherit characteristics and respond within that set characteristics to their environment. Comparing different life cycles and means of reproduction. Parents pass on their characteristics to new generations with small variations, Specific responses to environmental conditions like heat, light, gravity.

Life Cycles & Reproduction - plants and animals Parents & Babies – Inheritance and variation Plant response to environment

3: Answers "Why is there so much diversity?" Once you know that different structures help different LT thrive in different environments (1st) and how LT pass on their characteristics with variations (2nd), you can learn about adaptation or change over time. The idea is that LT with certain characteristics in a particular environment are more likely to reproduce many times. Over time most of the bears on the snow will be white because it's harder for dark ones to catch food. Second big idea is that this adaptation causes close relationship to the environment. When environment changes from LT or natural events, LT respond and may even disappear causing a loss of diversity.

Adaptation – change over time. Review: structures help LT thrive and reproduce in different environments Close relationship to environment: Env can change from LT or natural events Env change produces response or loss of species diversity

4: Relationships of LT – (Why diversity important) All LT, including humans, depend on each other and overall health of their environment for survival. This grade looks at these important relationships: to other living things for energy (food chains, webs), reproduction assistance, shelter; and to non-living things within structure of ecosystems (marginal species); special role of microorganisms.

Relationships of LT -
Energy (food chains, webs) // pollination, seed dispersal // shelter
Ecosystems – living and non-living parts, marginal species
Microorganisms

5: How do LT internal systems help them meet their needs? Looks inside at specialized structures and systems inside plants and animals that help them:

- get needed gases from the air (lungs vs. leaf stomata)
- get energy from digestion vs. photosynthesis to store as sugar and fat
- move needed elements and waste around (blood circulatory system vs. plant vascular system)
- use sugar in cells to obtain energy
- remove wastes (kidneys/bladder vs. leaf cells and stomata releasing oxygen)

Internal processes	
Animals –	Lungs, heart and blood circulatory system
	Digestion and cells using sugars
	Kidneys, bladder
Plants -	leaf photosynthesis and cells using sugars
	Plant vascular systems

Physical Science

K: Observing and naming are focus across all strands in K. This is an **intro to PS**: observing and labeling different materials and properties of matter. (flexibility, shape, size, weight, buoyancy); Start to explore matter by playing with and observing water changing through different states and back again.

Describe materials and properties
Water can change states
Evaporation into the air

1: Exploring states of matter. Moving beyond water to compare common properties of any solid, liquid or gas. All take up space and have weight, but each state acts in a different way. Noticing that these properties and states change with heating, cooling, or mixing.

Common properties of solids, liquids, gases Properties change with mixing, heating, cooling.

2: Motion & forces – what causes matter to move?: how you observe & describe motion**:** describe position, and observe change over time; different forces that cause motion (pushing/pulling – stronger force/bigger change, sound waves as vibration physically moving medium, physical w/tools, gravity, magnets)

Observe position and describe motion Change motion with force Force from tools, gravity, magnets, sound Sound as vibration – pitch, volume

3: Energy and Matter - In the physical universe there are two things that exist: matter and energy: **Energy** can take many forms: comes from Sun as light, can be stored, converted, carried (waves, current, moving objects). Start to explore energy by looking at **Light:** has source and direction, can be blocked, reflected, seen, contains many colors.

Matter can also take many forms: has 3 states for its mass/substance, states change with energy added or removed (add in heat, remove w/ cooling), matter can be combined to make something new, all matter is made of atoms too small to see; until we did experiments that revealed different atoms or elements, people thought matter was different combinations of earth/wind/fire/water

Energy : Energy can be stored, converted, carried Light is form of energy, sun to earth -straight line, shadows, reflection, color, vision Matter : 3 states (take up space, have weight) Energy additions/removal changes states Combining can create new substances Tiny atoms make up matter

4: Electricity and Magnetism - are related effects: – build circuits, notice currents can produce magnetic field so can build simple electromagnet; build compass to detect magnetic fields; behavior of magnets; then look at how electrically charged objects act like magnets. understand uses of electromagnets and electricity to do work

Build circuits Currents can produce magnetic fields – build electromagnet Compasses react to magnetic fields – build compass Similar behavior of magnets and electrically charged objects Uses of electricity and electromagnets

5: What is Matter? – atoms and molecules in ordered arrays. We arrange what we know about each element's (substance with only 1 kind of atom) unique properties in the periodic table. Most elements are metals. Metals are elements with specific set of properties – conduct heat & electricity, reactive, combine easily into alloys, make positive ion in solution, most elements are metals.
Just a few elements make up LT & most of the matter in universe.

Second part of standard is about combinations of elements and how only 112 elements can make up the wide variety of matter around us: atoms and molecules can combine and rearrange. When molecules combine, changing their ordered arrays, new molecular structures produce different properties. Learn properties of salts & common molecules (sugar, water, oxygen).
Just like we used properties to identify basic elements, you can use knowledge of the different properties of molecules and elements to separate mixtures & identify compounds;

Matter is atoms which combine into molecules, ordered arrays Periodic Table – elements are molecules one kind of atom, unique properties Metals have common properties Just few elements make all LT/most matl Atoms can combine and rearrange // different arrays // different properties // variety of matter Properties of salts Properties of common molecules

As we looked at the specific standards, you might have noticed that in general, the standards:

- Promote hands-on learning by focusing largely on science ideas that can be directly experienced and stipulating skills – you can use a diagnostic table, rather than you know what it is. This is because hands-on experiences are the most effective means of teaching science.
- leave a wide latitude for the teacher's discretion - tell you what, rock cycle, not how – you can choose your hands-on, field trips, reading. You can play to your strengths (music, art), adjust your approach for the current group of students, follow –up on kid's questions, or create connections to other subjects you want to teach – connecting to the gold rush - as you structure your lesson.

Middle School Standard Overview

6th grade looks at the Earth as a total system – it's geologic structure, resources, ecosystems, and energy flows.

7th grade focuses on living systems – what organisms are made of, how they inherit characteristics and evolve to create diverse forms, fossil evidence of historic life, relationship of structure and function, and physical principles related to the way organisms function (light and sight, force and muscles or joints)

8th grade focuses on looking closer at what we know about physical reality – motion, forces, the structure and related properties of all matter, structure of the universe, and how chemistry is related to the variety of matter and how living systems function.