SCOPE & SEQUENCE CREATED BY TEACHERS FOR THE TEACHERS OF SRC

"Give the pupils something to do; not something to learn; and if the doing is of such a nature as to demand thinking; learning naturally results."
~John Dewey

SANTA ROSA
COUNTY DISTRICT SCHOOLS

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How to Use This Planning Tool

The Scope and Sequence has been created by the Math & Science Department with a team of SRC teachers of the corresponding grade level, to help plan for meaningful instruction of science.

Format: Included is the **Benchmark**/standard from the FLDOE course description with the **Item Specifications**, which illustrate the fundamental knowledge and understanding needed for mastery, and the **Content Limits,** so that the teacher does not over-teach the standard.

Resources are also provided and differ depending on the grade level, as the emphasis in some grades is on writing, while others may be on reading. All resources, including the text, are considered part of the teacher's toolbox, and should be used appropriately to provide a hands-on, questioning, and science rich learning environment for the students.

The importance of Grades K-2 Science instruction: The content covered in Grades K-2 lays the foundational framework for future science study and is crucial to success in Grades 3-5. In most cases, K-2 is the first time that a science concept is taught, then it is taught one more time in 3-5 and assessed in 5th grade in the state assessment; WOW!! The misconceptions that need to be broken, and the foundations that need to be laid in K-2 are so important! You are our first line. Let our little ones ask questions, explore and see how the world around them works. You can do it! It takes work, but it can be done.
NSTA states that that “elementary students learn science best when –

a. They are involved in first-hand exploration and investigation and inquiry/process skills are nurtured.
b. Instruction builds directly on the student’s conceptual framework.
c. Content is organized based on broad conceptual themes common to all science disciplines.
d. Mathematics and communication skills are an integral part of science instruction.”

Integration of Nature of Science standards: The Big Ideas focusing on the Nature of Science should be consistently fused with content units as appropriate for your students throughout the year. It is covered alone in the first unit but needs to be continually reinforced throughout the year. Know your Nature of Science Standards.

Next Generation Sunshine State Standards

The Next Generation Sunshine State Standards for science are organized *by grade level* for grades K-8 and *by Bodies of Knowledge* for grades 9-12. Eighteen Big Ideas are encompassed in grades K-12 and build in rigor and depth as students advance.
Each grade level includes benchmarks from the four Bodies of Knowledge (Nature of Science, Life Science, Earth and Space Science, and Physical Science).

Kindergarten Overview

Kindergarten focuses instructional delivery for science within the following eight (8) Big Ideas/Standards:

Nature of Science:
Big Idea 1 – The Practice of Science

- Observations
- Keeping records (pictorial)

Earth and Space Science:
Big Idea 5 – Earth in Space and Time

- Explore gravity – dropped things fall
- Pattern of day/night
- Sun during day/moon mostly at night
- Perspective from Earth

Physical Science:

Big Idea 8 – Properties of Matter

- Sort by: size, shape, color, temperature, (hot, cold, weight, texture

Big Idea 9 – Changes in Matter

- Physical changes to paper and clay (cutting, tearing, crumpling, smashing, rolling)

Big Idea 10 – Forms of Energy Big Idea 12 – Motion of Objects

- Things that make sounds vibrate

Big Idea 13 – Forces and Changes in Motion

- Push/pull causes change in motion

Life Science

Big Idea 14 – Organization and Development of Living Organisms

- 5 senses and related body parts
- No personification
- Differences in plants and animals (structures and behaviors)

Santa Rosa County
Science Teacher's Kindergarten
Suggested Instructional Scope and Sequence

1st Quarter	**Week 1 – 6**	**Week 7 – 12**
	Doing Science and Engineering	**Matter**
	Unit 1 in text Big Idea: The Practice of Science *Standards:* **SC.K.N.1.1** (collaborate to collect information); **SC.K.N.1.2** (Make observations using the 5 senses); **SC.K.N.1.3** (keep records); SC.K.N.1.4 (observe and create visual representations); SC.K.N.1.5 (recognize that learning can come from observations)	**Unit 5 in text** Big Ideas: Properties of and Changes in Matter Standards: **SC.K.P.8.1** (sort objects by properties); **SC.K.P.9.1** (recognize that materials can change)

2nd Quarter	**Week 7 – 12**	**Week 13 – 21**
	Matter (cont.)	**Day and Night Sky**
	Unit 5 in text Big Ideas: Properties of and Changes in Matter *Standards:* **SC.K.P.8.1** (sort objects by properties); **SC.K.P.9.1** (recognize that materials can change) ***Use Halloween Candy for your objects to sort* ☺	**Unit 4 in text** Big Idea: Earth in Space and Time *Standards:* **SC.K.E.5.1** (explore gravity); **SC.K.E.5.2** (recognize patterns of day and night); SC.K.E.5.3 (recognize when the Sun can be seen); **SC.K.E.5.4** (observe the Moon – seen day and night); **SC.K.E.5.5** (observe space – big and small); **SC.K.E.5.6** (observe objects near and far from Earth)

3rd Quarter	Week 13 – 21	Week 22 – 24	Week 25 – 28
	Day and Night Sky cont.	**Energy**	**Motion**
	Unit 4 in text cont. Big Idea: Earth in Space and Time *Standards:* **SC.K.E.5.1** (explore gravity); **SC.K.E.5.2** (recognize patterns of day and night); SC.K.E.5.3 (recognize when the Sun can be seen); **SC.K.E.5.4** (observe the Moon – seen day and night); **SC.K.E.5.5** (observe space – big and small); **SC.K.E.5.6** (observe objects near and far from Earth)	**Unit 6 in text** Big Idea: Forms of Energy *Standard:* **SC.K.P.10.1** (observe how things that make sound vibrate)	**Unit 7 in text** Big Ideas: Motion of Objects and Forces & Changes in Motion *Standards:* **SC.K.P.12.1** (investigate movement – fast, slow, etc); **SC.K.P.13.1** (observe that push and pull can change the way an object is moving) *** In lesson 26 in your text magnets are covered. While not specifically defined in this standard, magnets are heavily tested and if you can allow for exploration of magnets and how they change movements of objects, that would be beneficial.
4th Quarter	**Week 29 – 31**	**Week 32 – 34**	**Week 35 – 38**
	Plants	**Animals**	**Putting it ALL together ENRICHMENT**
	Unit 3 in text Big Idea: Organization & Development of Living Things *Standard:* **SC.K.L.14.3** (observe plants & describe how they are alike and different)	**Unit 2 in text** Big Idea: Organization & Development of Living Things *Standard:* **SC.K.L.14.3** (observe animals & describe how they are alike and different); **SC.K.L.14.2** (recognize how books and media portray animals and plants – characteristics and behaviors – and compare to “real life”)	

Kindergarten Suggested Scope and Sequence			
NGSSS Body of Knowledge: Nature of Science/Life Science Unit of Study: Doing Science & Engineering			(6 weeks)
Topics	Learning Targets/Skills	Standard(s)	Vocabulary
Introduction to Science	*Collaborate with a partner to collect information.* ***Students will:*** • **develop** a science notebook (whole class and/or individual) that will be used all year long to document learning (e.g., observations, measurements, pictures, vocabulary). • **discuss** scientific tools (e.g., beaker, graduated cylinder, measuring cup, thermometer, hand lens, goggles) that scientists use to make their work easier. • **draw** a picture of what a scientist looks like and present it to classmates and the teacher. • **collaborate** with a partner to collect information from an activity (e.g., name objects seen in a picture, draw pictures of things seen on a walk around the schoolyard, sort a pile of common things found in the classroom or things found in nature,find the length of objects using popsicle sticks).	**SC.K.N.1.1**	**answers** **collect partner problem** **question science** **science notebook science** **tools scientist** **sort**
Five Senses Sight Taste	*Recognize the five senses and related body parts.* ***Students will:*** • **name** *sight* as one of the five senses. • **identify** that the eyes correspond to the sense of sight (on their own body and through pictures). • **describe** objects by using the sense of sight ONLY (color, shape, size). • **explore** how light impacts sight. • **explore** tools that scientists use to enhance, and sometimes hinder, the sense of sight for protection (e.g., goggles, hand lens, microscope, glasses, sunglasses, binoculars). ***Students will:*** • **name** *taste* as one of the five senses. • **identify** that the tongue corresponds to the sense of taste.	**SC.K.L.14.1**	**eyes** **five senses** **goggles** **hand lens** **observation** **sight** **fingers** **skin** **texture** **touch (feel)** **bitter** **ears** **hear** **nose** **salty** **smell** **sound** **sour** **sweet** **taste**

Five Senses Touch Hearing Smell	• **describe** the taste of different substances (sour, sweet, bitter, salty). • **explore** the relationship between smell and taste.		**tongue** **waft**
	Students will: • **name** *touch* as one of the five senses. • **identify** that the fingers and skin correspond to the sense of touch. • **describe** the feel (texture) of objects using the sense of touch (e.g., soft, hard, cold, warm, sticky, rough, smooth). • **determine** a hidden object by its feel (e.g., feely box, feely socks, feely bag). • **explore** tools that scientists use to reduce, and sometimes eliminate, the sense of touch for protection (e.g., gloves, oven mitts, shoes, tongs, forceps).		
	Students will: • **name** *hearing* as one of the five senses. • **identify** that the ears correspond to the sense of hearing. • **describe** the sound an object can make (e.g., low/high pitch-thud and screech, loud/soft volume-siren and whisper, tweet, buzz, beep). • **determine** a mystery sound (e.g., recordings, mystery sound box/bag). • **determine** the location of real-world sounds heard during a sound walk around the school campus. • **explore** tools that reduce and enhance the sense of hearing (e.g., hands, head phones, ear plugs, hearing aide, stethoscope, cup telephones).		
	Students will: • **name** *smell* as one of the five senses. • **identify** that the nose corresponds to the sense of smell. • **use** the proper technique for smelling substances (wafting). • **identify and describe** the smell of different mystery substances.		

Investigations Using Five Senses	*Make observations of the natural world and know that they are descriptors collected using the five senses.*	**SC.K.N.1.2**	**answers** **ask**

	Recognize that learning can come from careful observation. ***Students will:*** • **explore** basic science process skills with a partner that are important to a scientist through hands-on investigations (e.g., observing, sorting, predicting, comparing, measuring, communicating). • **explore** the hands-on use of science tools with a partner (e.g., hand lens, thermometer, balance, measuring cup, beaker, ruler, meter stick, timer) that help scientists gather information about the world around them. • **observe and describe** familiar things from the natural world using the five senses (e.g., plants, animals, rocks, sky, weather). • **observe and describe** a familiar, man-made object using the five senses (e.g., plastic fork, marker, chair, baseball bat, mitten). • **list** new things learned after making careful observations and hearing the observations of others. • **identify and describe** the roles the senses play in a given situation (e.g., sitting around a campfire, riding a bike, playing at the beach, popping corn in an air popper, making applesauce, using scented and colorful play dough). • **ask questions and find answers** about the world around them using their five senses.	**SC.K.N.1.5**	**balance** **beaker** **communicate** **compare** **describe** **find** **explore** **hand lens** **measure** **measuring cup** **yard/meter stick** **observation** **observe** **predict** **question** **ruler** **science tools** **sort** **thermometer** **timer**

Resource Alignment	**Introduction to Science**	**Five Senses - Part One**		
		Sight	**Touch**	**Hearing**
HMH Teacher Edition	Unit 1 Lesson 2-5	Unit 1 Lesson 1	Unit 1 Lesson 1	Unit 1 Lesson 1
HMH Student's Edition	*Pg. 5-22*	*Pg. 1-4*	Pg. 1-4	Pg. 1-4
Hands on Student Activities/ Labs	See Below	Mirrors All about Me I Spy Game	Touch Box Feel Boards	Sound Shaker Test Mystery Sounds

Teacher Hints	• Interactive notebooks can be developed whole class and/or individually. Developing a whole-class notebook gives the teacher the opportunity to model expectations so that the transition to using individual science notebooks is easier later in the school year. • A junk box consisting of items commonly found in your classroom can be used over and over for sorting activities. Beans, buttons, shells, rocks, coins, blocks, nuts/bolts, crayons, and toy cars are easy real-world objects to acquire for sorting activities. • Non-standard units of measure (e.g., pretzel sticks, marbles) will be used when determining the length and weight of objects in grade K.	• The sense of sight is the most developed sense in humans. • Students can discover that light is necessary for objects to be seen. • The sense of touch is not highly developed in students of this age. • A description of how something feels is relative making this a difficult task for some students. • Hearing is the sense that is second only to sight in the degree of development in humans. • The descriptions of sound may include, but are not limited to, the following: loud, soft, ringing, clanging, beeping, squawking, dripping, howling. • Wafting is a safe method of smelling substances by fanning your hand over the substance pulling the smell towards your nose. • Tasting in science is a safety issue. Continually impress upon children the need to never taste a substance unless specifically instructed to do so. • Taste is a sense that relies heavily on the sense of smell. Try holding your nose and tasting an unknown flavor of life saver. Make a prediction of what flavor it is. Let go of your nose and make another prediction. Check to see if your prediction was correct.		
Daily and Key Questions	How do we use Science skills? How do we use Science tools? What Science tools do we use? How do engineers solve problems? What is the design process?	What do your eyes help you do? Name things you see in the classroom? How does being able to see things help you?	What do your fingers help you do? How do you think the sand feels? (pg. 1)	What do your ears help you do? What can you hear right now?
CPALMS	*Let's Be Scientists: Notebooking with a Purpose* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/29792* *Sorting Lessons* *http://www.cpalms.org/Public/PreviewResourceUpload/Preview/12681*	The Five Senses *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/32588* Our Senses *http://www.cpalms.org/Public/PreviewResourceUrl/Preview/18063* Exploring the Five Senses *http://www.cpalms.org/Public*		*Kindergarten Listening Walk* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46159*

		/PreviewResourceUpload/Preview/13294		
Web Resources	Brain Pop Jr.: *Making Observations* https://jr.brainpop.com/science/beascientist/makingobservations/	Brain Pop Jr.: *Senses* https://jr.brainpop.com/health/bodies/senses/ Brain Pop Jr.: *Writing with the Senses eyes! A 5 senses sing-along* https://jr.brainpop.com/readingandwriting/writing/writingwiththesenses/	*NeuroScience for Kids* http://faculty.washington.edu/chudler/chtouch.html	*Vibrations* *Make Sounds* *Hearing (5 senses video)* https://safeshare.tv/x/CwJXKaCeIC
Supplemental Literature Books	*What is a Scientist?* - Barbara Hehn *Scientists Ask Questions*- Ginger Garrett Newbridge Book: *What Do Scientists Do? What Is Science?* Rebecca Kai Dotlich *You Can Use a Magnifying Glass* -Wiley Blevins *You Can Use a Balance (Rookie Read- About Science)* - Linda Bullock *Everyone Is a Scientist* –Trumbauer *Looking Through a Microscope*- Linda Bullock	*Seeing*- Rebecca Rissman *See*-Maria Russ *Look, Listen, Taste, Touch, Smell*- Hill Nettleton *In the Tall, Tall Grass* - Denise Fleming *Brown Bear, Brown Bear, What Do You See?* - Bill Martin Jr. Newbridge Book: *See, Hear, Touch I See*-Jo Clelana	*I Went Walking* - Sue Williams *Touching*-Rebecca Rissman *I Touch*-Jo Clelana *Touch*-Maria Russ	*Clang, Boom, Bang*- Jane Belk Moncure *Sound and Hearing*- Angela Royston *The Listening Walk*- Paul Showers *Noisy Nora*- Rosemary Wells *Polar Bear, Polar Bear, What Do You Hear?* - Bill Martin Jr. *Hear*-Maria Russ *Hearing*- Rebecca Rissman *I Hear*- Jo Clelana

Resource Alignment	**Five Senses - Part Two**		**Investigations Using Five Senses**
	Smell	**Taste**	
HMH Teacher Edition	Unit 1 Lesson 1	Unit 1 Lesson 1	
HMH Student Edition	Pg. 1-4	Pg. 1-4	
Hands on Student Activities/ Labs	Mystery Cans	Taste Test	
Teacher Hints			• Descriptions of the basic science process skills (inquiry) can be found on page 8. • Observation is the foundation of the science processes. Initial information about an object comes from the sense of sight. • Making observations in a science classroom includes the use of all five senses (when appropriate). Help students avoid the misconception that

			observations only include what they can see. • Students should be purposefully engaged in activities that incorporate multiple senses. • Observations should lead to questions. As students engage in becoming better observers (attention to details), they will also become more curious and ask more questions. • An explanation of what has been learned should include evidence from what has been observed using the five senses. (I learned _____ because I observed _____ by using my sense of_____.). • Non-standard units of measure are used in Kindergarten. Students will measure length, volume, weight, and temperature using objects such as cubes, paper clips, pennies, popsicle sticks, pretzels, and marbles. • The following descriptors should be used when describing or comparing length, volume, weight, and temperature: long/short, wide/narrow, tall/short, empty/full, heavy/light, hot/warm/cold. • An explanation of what has been learned should include evidence from what has been "measured" with non-standard units of measure. (I learned _____because I used _____ to measure_____.). • Handling scientific tools such as beakers, rulers, and thermometers (precise measurements not required) to conduct simple investigations will provide students with early experiences that will set them up for success when they begin using standard units of measure (inches and centimeters) in grade 1.
Daily and Key Questions	What does my nose help me do? What is a good smell?	What does your mouth help you do? What food taste best to you?	Which sense did you use? What body part did you use?
CPALMS	*Taste vs. Smell* *http://www.cpalms.org/Public/PreviewResourceUrl/Preview/20375* *Does the Nose Know?* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/34895*		*Vegetables….in Cupcakes?* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/30777*
Web Resources			*Backyard Science…The Five Senses* *https://serc.carleton.edu/sp/mnstep/activities/27245.html*

Supplemental Literature Books	*I Smell*-Jo Clelana *Smelling*-Rebecca Rissman *Smell*-Maria Russ	*I Taste*-Jo Clelana *Tasting*-Rebecca Rissman *Taste*-Maria Russ	My Five Senses- Aliki Fun With My Five Senses- Sarah Williamson My Five Senses- Margaret Miller	The Five Senses- Sally Hewitt The Five Senses- Nuria Rose and Rosa M. Curto

Kindergarten Suggested Scope and Sequence			
NGSSS Body of Knowledge: Physical Science Unit of Study: Matter			(6 Weeks)
Topics	Learning Targets/Skills	Standard(s)	Vocabulary
Properties of Matter	*Sort objects by observable properties, such as size, shape, color, temperature (hot or cold), weight (heavy or light) and texture.* *Keep records as appropriate-such as pictorial records of investigations conducted.* ***Students will:*** • **discuss** types of observations scientists make (e.g., size, color, temperature, texture, time, quantity, changes to objects). • **discuss** different ways scientists record their observations during investigations (e.g., notes, charts, illustrations, video). • **describe** objects by their observable properties after collaborating with a partner (e.g., shape, color, size-big/small/tall/short, weight-heavy/light, texture-soft/hard/rough/smooth, temperature-hot/cold). • **sort** objects according to an observable property comparing the quantity (more/less) in each group. • **re-sort** the same objects according to a different observable property comparing the quantity (more/less) in each group. • **explain** the reasoning of how objects have been sorted	**SC.K.P.8.1** **SC.K.N.1.3** Embedded Nature of Science SC.K.N.1.1 SC.K.N.1.2 SC.K.N.1.5	**estimate** **heavy** **investigate** **light** **matter** **pan balance** **predict** **property (attribute)** **record** **ruler** **science notebook** **sort** **temperature** **texture** **weight**

	and re-sorted. • **estimate and compare** the sizes of different objects (long/short, tall/short, wide/narrow, thick/thin, big/little). • **estimate and compare** the weights of different objects (heavier/lighter) using their hands and a pan balance. • **estimate and compare** the temperature of different objects through touch (hot/warm/cold). • **record** predictions, observations and results of investigations in pictorial or written form in a science notebook as a class and/or as an individual.		
Changes in Matter	*Recognize that the shape of materials such as paper and clay can be changed by cutting, tearing, crumpling, smashing, or rolling.* *Observe and create a visual representation of an object which includes its major features.* ***Students will:*** • **describe** an object, including its major features, using as many of the five senses as possible. • **match** a description of an object to its 2-dimensional or 3-dimensional visual representation (model). • **create** a 2-dimensional or 3-dimensional model of an object using paper or clay. • **demonstrate** multiple ways to change the shape and size of the paper or clay model (e.g., fold, bend, cut, tear, crumple, smash, roll, soak, heat, freeze). • **match** altered forms of materials to their originals (e.g., ripped up pieces of paper to a full sheet, smashed piece of gum to a piece right out of the wrapper, liquid water to ice). • **explain** that when these changes are made to paper and clay, only the shape or size of the material changes, not the material itself. • **demonstrate** how other objects or substances change when heated or cooled (e.g., chocolate, water/ice, crayon). • **record** observations of the object before and after change in science notebooks.	**SC.K.P.9.1** **SC.K.N.1.4** Embedded Nature of Science SC.K.N.1.2 SC.K.N.1.3 SC.K.N.1.5	**bend** **change** **cool** **crumple** **cut** **fold** **heat** **model** **roll** **smash** **soak** **tear**

Resource Alignment	Properties of Matter	Changes in Matter
HMH Teacher Edition	Unit 5 Lesson 17	Unit 5 Lesson 18 and 19
HMH Student Edition	*Pg. 69-74*	*Pg. 75-82*
Hands on Student Activities/ Labs	Sorting Gas Bag	Change paper Ice Cube Race
Daily Essential Questions	What are some ways to sort objects?	How can we change the shape of objects? How can heating and cooling change matter?
Key Questions	**What are some observable properties?** size, shape, color, texture (smooth/rough) etc. **How can a materials temperature be described?** hot (warm), cold (cool), room temperature **How can a materials weight be described?** heavy or light	**What are physical properties?** the materials physical and/or structural features **How can you physically change the shape of paper or clay?** cutting, tearing, crumpling, smashing or rolling **What is a physical change?** a change from one form to another without turning into a new substance
Teacher Hints	• Students are not responsible for being able to distinguish materials as solids, liquids, or gases in Kindergarten (only the material's properties that can be observed with or without tools). • A pan balance, ruler, and thermometer can be used to compare the weight, length (including width and height), and temperature of materials. Standard measurement in precise units (inches and centimeters) will be taught in Grade 1 (science).	• The primary focus of this benchmark is to be able to explain that materials change in many ways (e.g., size, shape, color, texture, temperature). Students do not need to understand the difference between physical and chemical change even though the textbook provides examples of both. • Physical changes can generally be described by noting the change in size and form of an object.
CPALMS	*Sorting Junk!* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/11551* *Observable Properties of Matter* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46090*	*Physical Changes* *http://www.cpalms.org/Public/PreviewResourceUpload/Preview/12916*
Web Resources	*YouTube: Kindergarten Sorting and Classifying* *https://www.youtube.com/playlist?list=PL97E500233E35DBFA*	*YouTube: Thermometer Song* *https://www.youtube.com/watch?v=Vk6rP_4wpvk*
Supplemental Literature Books	*What is Matter?* – Don L. Curry *The Button Box* – Margaret S. Reid *Matter: See It, Touch It, Taste It, Smell It* – Mark Stille *Is It Hard or Soft?* by Victoria Parker (Raintree, 2005)	*Heating* by Patricia Whitehouse (Heinemann, 2004)

Kindergarten Suggested Scope and Sequence NGSSS Body of Knowledge: Earth/Space Science Unit of Study: Day & Night Sky (9 Weeks)			
Topics	Learning Targets/Skills	Standard(s)	Vocabulary
Day and Night Sky	*Recognize the repeating pattern of day and night.* ***Students will:*** • **identify** activities that are done during the day. • **identify** activities that are done during the night. • **explain** how daytime activities are different from nighttime activities. • **identify** details in nature that make day different from night. • **create** 2-dimensional and 3-dimensional models of things that are visible in the day and/or night sky. • **describe** the repeating pattern of day and night. **In 2018, in this scope and sequence, there will be a "Beaver Moon" on Nov. 23rd, and a "Cold Moon" on Dec. 22nd https://www.space.com/16830-full-moon-calendar.html Find the Moon's calendar at https://www.calendar-12.com/moon_calendar/2018/november If you are interested ☺	**SC.K.E.5. 2** Embedded Nature of Science SC.K.N.1.1 SC.K.N.1.4	**clouds** **dawn** **day (daytime)** **dusk** **moon** **night (nighttime)** **pattern** **rise** **set** **sky** **stars** **sun**
	Recognize that the Sun can only be seen in the daytime. ***Students will:*** • **identify and describe** the sun. • **describe** attributes that define daytime (with the sun as the primary detail). • **identify** how the sun appears to rise at dawn, move across the sky during the day, and set at dusk.	**SC.K.E.5.3** Embedded Nature of Science SC.K.N.1.2 SC.K.N.1.3 SC.K.N.1.5	
	Observe that sometimes the Moon can be seen at night and sometimes during the day. ***Students will:*** • **identify and describe** the moon. • **describe** attributes that define nighttime (with the moon as a primary detail).	**SC.K.E.5.4** Embedded Nature of Science SC.K.N.1.2 SC.K.N.1.3 SC.K.N.1.5	

	• **describe** how the moon appears to change shape and brightness. • **observe and discuss** how sometimes the moon can be seen during the day while the sun is out.		
	Observe that things can be big, and things can be small as seen from Earth. ***Students will:*** • **compare** the size of an object on the ground to one seen in the sky (e.g., airplane, hot air balloon, parachute, bird, kite). • **explain** how the object looks smaller in the sky even though it does not change in size. • **discuss** how objects appear to get smaller the farther away they get and larger the closer they get. • **make observations** of objects found in space (sun, moon, and stars).	**SC.K.E.5.5** Embedded Nature of Science SC.K.N.1.2 SC.K.N.1.3 SC.K.N.1.5	**appear** **big (large)** **distance** **far away** **nearby** **size** **small**
	Observe that some objects are far away, and some are nearby as seen from Earth. ***Students will:*** • **compare** the apparent size of stars to the apparent size of the sun and moon as seen from Earth. • **explain** the distance of some objects in the day and night sky in relation to Earth (stars are farther away from Earth than the sun and moon). • **explain** that the moon looks larger than the stars because it is closer to Earth (nearby) even though it is not larger and vice versa (far away). • **explain** that the sun looks larger than the other stars because it is closer to Earth (nearby) even though it is smaller than some of the other stars and vice versa (far away).	**SC.K.E.5.6** Embedded Nature of Science SC.K.N.1.2 SC.K.N.1.5	
Gravity ****NOT IN TEXT!!****	*Explore the Law of Gravity by investigating how objects are pulled toward the ground unless something holds them up.* ***Students will:*** • **predict** what will happen to objects when supports that are holding them up are removed. • **collaborate** as a class about how to collect data during a gravity investigation (e.g., record simple descriptive sentences/phrases, record a video,	**SC.K.E.5.1**	**gravity** **hold up** **pull down**

	collect tally marks, draw pictures). • **investigate** how objects are pulled toward the ground unless something holds them up. • **record** predictions, observations and results of a gravity investigation in pictorial or written form in a science notebook. • **identify** gravity as the reason objects are pulled toward the ground (fall) when they are not held up by something. • **describe** what has been learned after carefully observing the effects of gravity and hearing the observations of others.		

Resource Alignment	Day and Night Sky	Distance from Earth	GRAVITY
HMH Teacher Edition	Unit 4 Lesson 15	Unit 4 Lesson 16	N/A
HMH Student Edition	Pg. 61-64	Pg. 65-68	N/A
Hands on Student Activities/ Labs	Look at the Sky Shadows Planetarium	Demonstration	Drop a Ball Gravity painting with a marble
Daily Essential Questions	How does the sky change from day to night?	What are some ways that we can observe distant objects?	Why do we stay on the ground?
Key Questions	**What causes day and night?** the Earth rotates into day and (west) away from the sun into nigh **What objects can be seen in the day time sky?** the sun, clouds and sometimes the moon **What objects can be seen in the night sky?** moon, stars, planets and sometimes other objects (i.e. comets) **Which object is never seen in the night sky? Why?** the sun, because the sun in the sky causes day time	**What is the biggest object in the sky (solar system**)? the sun	What would happen if we didn't have gravity? How can we demonstrate gravity?
Teacher Hints	• The sun is the closest star to the Earth. • Understanding that day and night repeats on a regular basis is foundational to the understanding that day and night is caused by the rotation of Earth on its axis. Earth's	• Students need to define what makes an object big and what makes an object small. According to the class's definition, students should be able to accurately sort all kinds of objects. Eventually we want students to realize	• When objects fall, they are being pulled by gravity. • Gravity is a non-contact force that is difficult for young students to conceptualize. However, they have been fascinated

	rotation on its axis is taught in Grade 4. • Students may make observations that the shape of the moon appears to change over time. Teachers may want to consider making models of the different shapes of the moon that have been observed (e.g., clay, Oreo cookies, construction paper). • Tracking and recording the observable shapes of the moon is no longer a requirement outlined in the map. This concept will be taught in Grade 4. • Sort pictures seen in the day or night sky. • Record objects seen in both the day and night sky.	that size is relative. • Students need to define what determines when an object is far away and when an object is nearby. According to the class's definition, students should be able to accurately categorize all kinds of objects. Eventually we want students to realize that distance is relative. • The farther away something gets, the smaller it appears to become; the closer something gets the larger it appears to become. The object never actually changes in size. This is intuitive to us but not to students. • The relationship between size and distance is foundational to understanding concepts of size and distance as they relate to space (this concept is further developed in Grade 3). • The moon is closer to Earth than the stars. The moon appears to be larger than the stars. The relationship that exists between size and distance is what explains why the moon appears to be larger than the stars even though it is not. • Consider discussing size and distance relationships accurately represented in fiction and non-fiction literature	by gravity since they started dropping objects repeatedly off their high chairs. • This concept is rooted in a cause/effect relationship and students should be comfortable expressing the relationship.
CPALMS	*Day and Night* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/19039* *Objects in the Sky* *http://www.cpalms.org/Public/PreviewResourceUrl/Preview/1761* *Sun and Moon / Day and Night* *http://www.cpalms.org/Public/PreviewResourceUpload/Preview/12677* *Moon Walk* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/28931*	*Big, Small, Near, Far* *http://www.cpalms.org/Public/PreviewResourceUpload/Preview/12678*	*Building a Tall a Tower- An Engineering Design* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/37741*

Web Resources	Brain Pop Jr.: *Seasons* *Eye on the Sky Activity* *http://cse.ssl.berkeley.edu/first/EyeontheSkyWeatherJournal/* *Oh My, What a Sky!* *YouTube: Day and Night for Kids* *When Can You See a Daytime Moon?*	Ms. Wood's Kindergarten: *Near and Far* *How Small the Earth Is* *YouTube: Telescopes*	*Brain Pop jr Gravity*
Supplemental Literature Books	What Makes Day and Night?- Franklyn Branley The Moon Seems to Change- Franklyn Branley It Looked Like Split Milk- Charles Shaw So That's How the Moon Changes Shape- Allan Fowler Clouds- Anne Rockwell Weather Words- Gail Gibbons The Moon Book- Gail Gibbons Sun Up,Sun Down- Gail Gibbons Goodnight Moon- Margaret Wise Brown Happy Birthday Moon- Frank Asch Papa, Please Get the Moon For Me- Eric Carle What Makes a Shadow- Clyde Robert Bulla What's Out There? A Book About Space- Lynn Wilson *The Moon* by Martha E.H. Rustard (Capstone Press, 2002) *Neil Armstrong* by Dana Meachen Rau (Children's Press, 2003) *The Sun Is My Favorite Star* by Frank Asch (Voyager/Harcourt, 2008) *Sunshine, Moonshine* by Jennifer Armstrong (Random House, 1997)	*Looking Through a Telescope (Rookie Read-About Science)* - Linda Bullock *A High, Low, Near, Far, Loud, Quiet Story*- Nina Crews *Near and Far*- Tami Johnson	*Gravity: Forces and Motion* – Rachel Lynette *Gravity is a Mystery* - Franklyn M. Branley *What is Gravity?* - -Lisa Trumbauer *I Fall Down* - Vicki Cobb

Kindergarten Suggested Scope and Sequence			
NGSSS Body of Knowledge: Physical Science Unit of Study: Energy			(3 Weeks)
Topics	Learning Targets/Skills	Standard(s)	Vocabulary
Sound	*Observe that things that make sound vibrate.* ***Students will:*** • **distinguish** soft sounds from loud sounds (e.g., ringing a bell and sounding a fire alarm, dropping a cotton ball and dropping a wooden block). • **observe** that sounds are made when parts of musical objects vibrate (e.g., guitar strings, drums, musical triangles, xylophones, cymbals, tambourines). • **investigate** other ways vibrations can be seen and felt (e.g., striking tuning forks and placing in water, plucking rubber bands, feeling vocal cords when speaking, feeling a radio speaker, saying some letter sounds and feeling it on the lips). **keep records** of sound investigations in a science notebook.	**SC.K.P.10.1**	**Sound** **Vibrate** **Soft** **Loud** **High** **Low**
****FLUFF ALERT!!! Light and Heat are in the text in this section next but ARE NOT covered by ANY STANDARDS FOR KINDERGARTEN!!!**	*Light/Heat- no learning targets/skills for kindergarten*	**None!**	

Resource Alignment	Sound
HMH Teacher Edition	Unit 6 Lesson 20
HMH Student Edition	Pg. 83-86
Hands on Student Activities/ Labs	Making Instruments

Daily Essential Questions	**What is sound?** a type of energy you can hear **How are sounds made?** when materials vibrate **What is vibration?** when a material moves quickly back and forth **How are sounds different?** some are loud and others soft; some have a high pitch; some a low pitch **What are musical instruments?** objects people use to make sound (music) **Why do musical instruments sound different?** because instruments vibrate in different ways (i.e. wind, string, striking) **What are some common materials that can be used to make musical instruments?** rubber-band, drinking straw, balloon, bottle, comb, etc.
Key Questions	**What is sound?** **How do objects make sound?**
Teacher Hints	• All sound is made by vibrating matter. Vibrations are back-and-forth movements. • Vibrations can often be seen and felt • Soft and loud sounds refer to the volume (loudness) of sound. High and low sounds refer to pitch. While students do not need to know the difference between volume and pitch, be careful to avoid associating high and low sounds with volume (loudness). • Collaborate with the music teacher to develop an instructional plan to support sound energy.
Web Resources	PBS: Sound Vibrations YouTube: Sound Waves and Vibrations Vibration Science
CPALMS	**Exploring Instruments in Kindergarten** http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46250 *Recycled Music*
Supplemental Literature Books	All About Sound-Lisa Trumbauer Clang, Boom, Bang- Jane Belk Moncure Oscar and the Bat: A Book About Sound by Geoff Waring (Candlewick, 2009) Alexander Graham Bell by Lola M. Schaefer (Capstone Press, 2003) More Picture Sounds All Around- Wendy Pfeffer Sound and Hearing- Angela Royston

Kindergarten Suggested Scope and Sequence			
NGSSS Body of Knowledge: Physical Science Unit of Study: Motion			(4 Weeks)
Topics	Learning Targets/Skills	Standard(s)	Vocabulary
How Things Move	*Investigate that things move in different ways, such as fast, slow, etc.* ***Students will:*** • **demonstrate and describe** the different ways their bodies and other objects move (e.g., roll, fly, crawl, swim, bounce, hop, run, waddle, wiggle, sway, tumble, pounce, walk, jump, skip). • **describe** the speed at which things move (fast and slow). • **investigate** different directions of motion (e.g., forward, backward, upward, downward, sideways, back-and-forth, up and down, in a circle, zigzag, straight). • **record** predictions, observations and results of movement investigations in pictorial or written form in a science notebook. • **describe** what has been learned after carefully observing the movement of objects and hearing the observations of others.	**SC.K.P.12.1** Embedded Nature of Science SC.K.N.1.2 SC.K.N.1.3 SC.K.N.1.5	**back-and-forth** **backward** **direction** **downward** **fast** **forward** **motion** **movement** **slow** **upward** **zigzag**

Changing How Things Move	*Observe that a push or a pull can change the way an object is moving.* ***Students will:*** • **describe** the position of an object (e.g., on, in, above, below, under, between, before, after, beside). • **collaborate** with a partner to discuss ways to change an object's motion. • **demonstrate** ways to make an object change position/move. • **predict** how a push and pull will change an object's speed and/or direction. • **investigate** how push and pull can change the speed or direction of an object's movement (fast, slow, back and forth, up and down). • **record** predictions, observations and results of push and pull investigations in pictorial or written form in a science notebook. • **describe** what has been learned after carefully observing the change in an object's motion and hearing the observations of others.	**SC.K.P.13.1** Embedded Nature of Science SC.K.N.1.1 SC.K.N.1.2 SC.K.N.1.3 SC.K.N.1.5	**above** **after** **before** **below** **beside** **between** **direction** **in** **motion** **movement** **on** **pull** **push** **speed** **under**

Resource Alignment	How Things Move	Changing How Things Move
HMH Teacher Edition	Unit 7 Lesson 24	Unit 7 Lesson 25
HMH Student Edition	Pg. 101-106	Pg. 107-110
Hands on Student Activities/ Labs	Push / Pull STEAM Ramps Marble Run	Push / Pull STEAM Ramps Marble Run
Daily Essential Questions	**What is motion?** the change in the position of an object caused when a force is applied **How can force change the motion of an object?** a force can speed up, slow down or change the direction of an object **What is a force?** force is a push or pull	**What is motion?** the change in the position of an object caused when a force is applied **How can force change the motion of an object?** a force can speed up, slow down or change the direction of an object
Key Questions	**What are some ways to describe motion?**	**How can I change the motion of an object?**

Teacher Hints	• It takes a push or pull to cause motion.
	• A push or pull may require contact.
	  • Throwing a ball is a push that requires contact.
	  • Propelling a boat forward through the water is a push that requires contact.
	  • Picking up an object is a pull that requires contact.
	  • Tightening a belt is a pull that requires contact.
	• A push or pull does not always require contact.
	  • Repulsion of two magnets demonstrates a push that does not require contact.
	  • Gravity acting on an object demonstrates a pull that does not require contact.
	  • Blowing air through a straw demonstrates a push of an object without touching it.
	  • Sucking air through a straw demonstrates a pull on an object without touching it.
	  • Include the exploration of magnetism when instructing motion. Like poles of two magnets will repel (push). Opposite poles of two magnets will attract (pull).
		• Continue exploration of magnetism when instructing pushes/pulls and changes in motion.
		• When an object moves it always changes position and sometimes changes direction.
		• Additional words that can describe the position of an object may include, but are not limited to, the following: over, beneath, to the right/left of, and behind.
		• Force is required to make an object move. Young children know that it requires a push or pull to move things. They also realize that they do not always have enough force in their own strength to move some objects.

CPALMS	*Bubble Baffle* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/30457* *The Fire Wheels* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/32328*	*Pushes and Pulls* *http://www.cpalms.org/Public/PreviewResourceUrl/Preview/50800* *Forces and Movement* *http://www.cpalms.org/Public/PreviewResourceUrl/Preview/51643* *Forces: Pushing & Pulling* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/37021*
Web Resources	Pushes and Pulls YouTube: the Motion Song BBC: Push and Pull	Forces and Movement Brain Pop Jr.: *Magnets*
Supplemental Literature Books	*Move It! (Motion, Forces and You)* - Adrienne Mason and Claudia Davila *Forces and Motion* - Tom DeRosa and Carolyn Reeves *Forces Make Things Move* - Kimberly Brubaker Bradley *Push and Pull* - Robin Nelson *Push and Pull* - Patricia Murphy *And Everyone Shouted, "Pull!"* - Claire Llewellyn	

Kindergarten Suggested Scope and Sequence			
NGSSS Body of Knowledge: Life Science Unit of Study: Plants and Animals			(6 Weeks)
Topics	Learning Targets/Skills	Standard(s)	Vocabulary
Plants	*Observe plants, describe how they are alike and how they are different in the way they look and in the things they do.* ***Students will:*** • **record** observations of many kinds of plants (flowers, trees, grass, cactus, bushes, fern) in a science notebook. • **observe** the parts of a plant using a hand lens (stems, roots, leaves, flowers, seeds, cones). • i**dentify** differences between different kinds of plants (e.g., some have cones, and some have flowers, some have thin leaves, and some have thick leaves). • **identify** similarities among different kinds of plants (e.g., they have oval-shaped leaves, they produce flowers, they change size). • **sort** plants by the way they look (e.g., leaf shape, size, color, other attributes). • **create** a 2-dimensional and/or 3-dimensional model of a plant and its parts. • **observe and explain** that plants grow and change as they get older. • **discuss** the needs of plants (water, soil, light, air, space).	**SC.K.L.14.3** Embedded Nature of Science SC.K.N.1.2 SC.K.N.1.3 SC.K.N.1.4 SC.K.N.1.5	**air** **change** **cone** **different** **flower** **grow** **leaves** **light** **model** **needs** **parts** **plant** **roots** **same** **seeds** **soil** **space** **stem** **sun** **water**
Animals	*Observe animals, describe how they are alike and how they are different in the way they look and the things they do.* ***Students will:*** • **describe** how animals are alike (physical characteristics, basic needs, and growth/change). • **record** observations of many kinds of animals in a science notebook. • i**dentify** differences between different kinds of animals. • **sort** animals by the way they look. • **observe and explain** that animals grow and change as they get older. • **discuss** the needs of animals.	**SC.K.L.14.3** Embedded Nature of Science SC.K.N.1.2 SC.K.N.1.3 SC.K.N.1.4 SC.K.N.1.5	**Alike** **Different**

	• **describe** how animals are different (physical characteristics, basic needs, and growth/change).		
Real vs. Imaginary	*Recognize that some books and other media portray animals and plants with characteristics and behaviors they do not have in real life.* ***Students will:*** • **identify** characteristics and behaviors of plants and animals shown in books and other media as real or imaginary. • **discuss** how plant characteristics and behaviors shown in books and other media are alike and different from the characteristics of a real plant (e.g., has green leaves, grew from a seed, grew to the clouds, talks to another oak tree). • **discuss** how animal characteristics and behaviors shown in books and other media are alike and different from the characteristics of a real animal (e.g., has two wings, eats nuts, sings a song, goes to school to learn).	**SC.K.L.14.2** Embedded Nature of Science SC.K.N.1.1 SC.K.N.1.2 SC.K.N.1.3 SC.K.N.1.5	**animal** **imaginary** **plant** **pretend** **real**

Resource Alignment	Plants	Animals	Real vs. Imaginary
HMH Teacher Edition	Unit 3 Lesson 11-14	Unit 2 Lesson 8-10	Unit 2 Lesson 6 -7
HMH Student's Edition	Pg. 45-60	Pg. 31-44	Pg. 23-30
Hands on Student Activities/ Labs	Growing a plant Seed in a bag		Comparing fiction and nonfiction
Daily and Key Questions	What are plants like? What do plants need? What are plants parts? How do plants grow and change?		How can you tell this is real or imaginary?
Teacher Hints	• This unit focuses on the plant portion of the Plants & Animals Unit of Study. This unit is working towards students being able to describe how plants compare to other plants, animals compare to other animals, and how plants compare to animals. • Plants make their own food; they do not eat food (there are exceptions though). • A plants does not move from one place	• Students should be able to compare the physical characteristics of plants and animals, the basic needs of plants and animals, and the ways they grow and change. • This is the portion of the Plants & Animals Unit of Study that describes how plants compare to animals.	• Students can generally tell you why a picture of a plant or animal is real or imaginary and provide some simple explanation of why. They will find it more challenging if they are asked to describe ways a single picture is both real and imaginary.

	to another by itself. • Plants have parts that are important to their survival.		
CPALMS	Learn About the Parts of a Plant http://www.cpalms.org/Public/PreviewResourceUrl/Preview/23324	*Comparing Plants, Animals, and Seeds* *http://www.cpalms.org/Public/PreviewResourceUpload/Preview/13316* *Variation* *http://www.cpalms.org/Public/PreviewResourceUrl/Preview/51262*	*Using Book Orders for Real and Make Believe* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/27036* *Real or Make-Believe* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/28950*
Web Resources	*Growing Plants*	*Plants and Animals in the Local Environment*	
Supplemental Literature Books	The Tiny Seed- Eric Carle From Seed to Plant- Gail Gibbons How a Seed Grows- Helene Jordan A Fruit is a Suitcase for Seeds- Jean Richards Stems (Plant Parts) - Vijaya Bodach Leaves (Plant Parts series) – Vijaya Bodach Flowers (Plant Parts) - Vijaya Bodach Roots (Plant Parts series) – Vijaya Bodach Seeds (Plant Parts series) – Vijaya Bodach Growing Vegetable Soup – Lois Ehlert The Reason for a Flower - Ruth Heller The Carrot Seed - Ruth Krauss Tops and Bottoms- Janet Stevens A Seed in Need – Sam Godwin	*Jack's Garden* - Henry Cole	*Charlotte's Web, Winnie the Pooh, Jack in the Beanstalk*


Resources:
Just for YOU!

Science Process Skills: Basic and Integrated

BASIC

Observing: using your senses to gather information about an object or event; a description of what is perceived; information that is considered to be qualitative data

Measuring: using standard measures or estimations to describe specific dimensions of an object or event; information considered to be quantitative data

Inferring: formulating assumptions or possible explanations based upon observations

Classifying: grouping or ordering objects or events into categories based upon characteristics or defined criteria

Predicting: guessing the most likely outcome of a future event based upon a pattern of evidence

Communicating: using words, symbols, or graphics to describe an object, action, or event

INTEGRATED

Formulating Hypotheses: stating the proposed solutions or expected outcomes for experiments; proposed solutions to a problem must be testable

Identifying Variables: stating the changeable factors that can affect an experiment; important to change only the variable being tested and keep the rest constant

Defining Variables: explaining how to measure a variable in an experiment

Designing Investigations: designing an experiment by identifying materials and describing appropriate steps in a procedure to test a hypothesis

Experimenting: carrying out an experiment by carefully following directions of the procedure so the results can be verified by repeating the procedure several times

Acquiring Data: collecting qualitative and quantitative data as observations and measurements

Organizing Data: making data tables and graphs for data collected

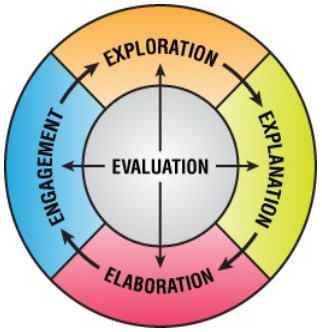
Analyzing Investigations: interpreting data, identifying errors, evaluating the hypothesis, formulating conclusions, and recommending further testing when necessary

5E Learning Cycle: An Instructional Model

ENGAGEMENT	EXPLORATION	EXPLANATION	ELABORATION	EVALUATION
The engagement phase of the model is intended to capture students' interest and focus their thinking on the concept, process, or skill that is to be learned. During this engagement phase, the teacher is on center stage.	The exploration phase of the model is intended to provide students with a common set of experiences from which to make sense of the concept, process or skill that is to be learned. During the exploration phase, the students come to center stage.	The explanation phase of the model is intended to grow students' understanding of the concept, process, or skill and its associated academic language. During the explanation phase, the teacher and students share center stage.	The elaboration phase of the model is intended to construct a deeper understanding of the concept, process, or skill through the exploration of related ideas. During the elaboration phase, the teacher and students share center stage.	The evaluation phase of the model is intended to be used during all phases of the learning cycle driving the decision-making process and informing next steps. During the evaluation phase, the teacher and students share center stage.

What does the teacher do?
• **create** interest/curiosity
• **raise** questions
• **elicit** responses that uncover student thinking/prior knowledge (preview/process)
• **remind** students of previously taught concepts that will play a role in new learning
• **familiarize** students with the unit
	What does the teacher do?
	• **provide** necessary materials/tools
	• **pose** a hands-on/minds-on problem for students to explore
	• **provide** time for students to "puzzle" through the problem
	• **encourage** students to work together
	• **observe** students while working
	• **ask** probing questions to redirect student thinking as needed
		What does the teacher do?
		• **ask** for justification/clarification of newly acquired understanding
		• **use** a variety of instructional strategies
		• **use** common student experiences to:
		  ○ develop academic language
		  ○ explain the concept
		• **use** a variety of instructional strategies to grow understanding
		• **use** a variety of assessment strategies to gauge understanding
			What does the teacher do?
			• **provide** new information that extends what has been learned
			• **provide** related ideas to explore
			• **pose** opportunities (examples and non-examples) to apply the concept in unique situations
			• **remind** students of alternate ways to solve problems
			• **encourage** students to persevere in solving problems
				What does the teacher do?
				• **observe** students during all phases of the learning cycle
				• **assess** students' knowledge and skills
				• **look** for evidence that students are challenging their own thinking
				• **present** opportunities for students to assess their learning
				• **ask** open-ended questions:
				  ○ What do you think?
				  ○ What evidence do you have?
				  ○ How would you explain it?

What does the student do?
• **show** interest in the topic
• **reflect and respond** to questions
• **ask** self-reflection questions:
  ○ What do I already know?
  ○ What do I want to know?
  ○ How will I know I have learned the concept, process, or skill?
• **make** connections to past learning experiences
	What does the student do?
	• **manipulate** materials/tools to explore a problem
	• **work** with peers to make sense of the problem
	• **articulate** understanding of the problem to peers
	• **discuss** procedures for finding a solution to the problem
	• **listen** to the viewpoint of others
		What does the student do?
		• **record** procedures taken towards the solution to the problem
		• **explain** the solution to a problem
		• **communicate** understanding of a concept orally and in writing
		• **critique** the solution of others
		• **comprehend** academic language and explanations of the concept provided by the teacher
		• **assess** own understanding through the practice of self-reflection
			What does the student do?
			• **generate** interest in new learning
			• **explore** related concepts
			• **apply** thinking from previous learning and experiences
			• **interact** with peers to broaden one's thinking
			• **explain** using information and experiences accumulated so far
				What does the student do?
				• **participate** actively in all phases of the learning cycle
				• **demonstrate** an understanding of the concept
				• **solve** problems
				• **evaluate** own progress
				• **answer** open-ended questions with precision
				• **ask** questions

Evaluation of Engagement The role of evaluation during the engagement phase is to gain access to students' thinking during the pre-assessment event/activity. Conceptions and misconceptions currently held by students are uncovered during this phase. These outcomes determine the concept, process, or skill to be explored in the next phase of the learning cycle.	**Evaluation of Exploration** The role of evaluation during the exploration phase is to gather an understanding of how students are progressing towards making sense of a problem and finding a solution. Strategies and procedures used by students during this phase are highlighted during explicit instruction in the next phase. The concept, process, or skill is formally explained in the next phase of the learning cycle.	**Evaluation of Explanation** The role of evaluation during the explanation phase is to determine the students' degree of fluency (accuracy and efficiency) when solving problems. Conceptual understanding, skill refinement, and vocabulary acquisition during this phase are enhanced through new explorations. The concept, process, or skill is elaborated in the next phase of the learning cycle.	**Evaluation of Elaboration** The role of evaluation during the elaboration phase is to determine the degree of learning that occurs following a differentiated approach to meeting the needs of all learners. Application of new knowledge in unique problem-solving situations during this phase constructs a deeper and broader understanding. The concept, process, or skill has been and will be evaluated as part of all phases of the learning cycle.	

Webb's Depth of Knowledge (DOK) Model of Cognitive Complexity

LOW COMPLEXITY Level 1 (Recall)	MODERATE COMPLEXITY Level 2 (Basic Application of Concepts and Skills)	HIGH COMPLEXITY Level 3 (Strategic Thinking & Complex Reasoning)	HIGH COMPLEXITY Level 4 (Extended Thinking & Complex Reasoning)
This level is the recall of information such as a fact, definition, or term, as well as performing a simple science process or procedure. Level 1 only requires students to demonstrate a rote response, use a well-known formula, follow a set, well-defined procedure (like a recipe), or perform a clearly defined series of steps. **Some examples are:** • Recall or recognize a fact, term, or property. • Represent a scientific concept or relationship in words or diagrams. • Provide or recognize a standard scientific representation for simple phenomena. • Perform a routine procedure, such as measuring length. • Identify familiar forces (e.g., pushes, pulls, gravitation, friction, etc.). • Identify objects and materials as solids, liquids, and gases.	This level includes the engagement of some mental processing beyond recalling or reproducing a response. The content knowledge or process involved is more complex than in Level 1. Level 2 requires that students make some decisions as to how to approach the question or problem. Level 2 activities include making observations, and collecting data; classifying, organizing, and comparing data; and representing and displaying data in tables, graphs, and charts. **Some examples are:** • Specify and explain the relationships among facts, terms, properties, and variables. • Identify variables, including controls, in simple experiments. • Distinguish between experiments and systematic observations. • Describe and explain examples and non-examples of science concepts. • Select a procedure according to specified criteria and perform it. • Formulate a routine problem given data and conditions. • Organize and represent data.	This level requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands at Level 3 are complex and abstract because the multi-step task requires more demanding reasoning than Level 2. Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve non-routine problems. **Some examples are:** • Identify research questions and design investigations for a scientific problem. • Design and execute an experiment or systematic observation to test a hypothesis or research question. • Develop a scientific model for a complex situation. • Form conclusions from experimental data. • Cite evidence that living systems follow the laws of conservation of mass and energy. • Explain the physical properties of the sun and its dynamic nature and connect them to conditions and events on Earth.	This level has the same high cognitive demands as Level 3 with the additional requirement that students work over an extended period or with extended effort. Students are required to make several connections—relating ideas within the content area or among content areas—and must select or devise one approach among many alternatives for how the situation or problem can be solved. It is important to note that the extended period is not a distinguishing factor if the required work is only repetitive and does not require the application of significant conceptual understanding and higher-order thinking. **Some examples are:** • Based on provided data from a complex experiment that is novel to the student, deduce the fundamental relationship among several variables. • Investigate, from specifying a problem to designing and carrying out an experiment and analyzing data and forming conclusions. • Produce a detailed report of a scientific experiment or systematic observation, and infer conclusions based upon evidence obtained.

More detailed information about Florida's DOK levels is available online at http://www.cpalms.org/cpalms/dok.aspx.

Levels of Depth of Knowledge for Science
Adapted from the Florida Interim Assessment Item Bank and Test Platform

Level 1

Recall or Reproduction…

is the recall of information such as a fact, definition, or term as well as performing a simple science process or procedure. Level 1 only requires students to demonstrate a rote response, restate information in their own words, and/or follow or perform a well-defined procedure.

Some Examples of Level 1 Performance

- Recall or recognize a fact, term, or property (e.g., how speed is determined).
- Represent a scientific concept or relationship in words or diagrams.
- Retrieve information from a chart, table, diagram, or graph.
- Recognize a standard scientific representation of a simple phenomenon (e.g., water cycle model).
- Identify common examples of topics, objects, and materials (e.g., familiar forces and invertebrates).
- Perform a routine procedure such as measuring length.

Question Stems

What is (was) _____?
What_____did you use?
What are some examples of_____?
How many _____?
Identify the _____?
Make a listing of_____?
Why did you choose_____?
How would you describe_____?
How can you recognize_____?
When did_____happen?
Recall what happened.
What happened when _____?
Retell.
Draw.
Select or retrieve _____?
What data represents _____?
Which_____has the most? Least?
Read your data table, chart, or graph.
Is_____ on the graph?
What pattern is seen when_____?

Levels of Depth of Knowledge for Science
Adapted from the Florida Interim Assessment Item Bank and Test Platform

Level 2

Basic Application…

is engaging in a mental process that goes beyond basic recall or reproduction, requiring two or more steps before giving a response. Students are asked to apply their knowledge of content on a simple level. Level 2 requires student to make some decisions as to how to approach a question or problem such as to classify, organize, and compare data.

Some Examples of Level 2 Performance

- Read and interpret information from a simple graph.
- Designate and explain the relationships among facts, terms, properties, and variables (e.g., compare physical properties of solids, liquids, and gases).
- Identify variable and controls in simple experiments.
- Distinguish between experiments and systematic observations.
- Describe and explain examples and non-examples of science concepts (e.g., flowering and non-flowering plants).
- Select a procedure according to specified criteria, and perform it.
- Formulate a routine problem given data and conditions.

Question Stems

Explain how_____affected_____.
Apply what you have learned to_____.
Compare/contrast.
How would you classify_____?
What could you use to classify?
How are_____alike? Different?
Summarize.
What do you notice about _____?
What do you observe? Infer?
What are some examples of_____?
What are some non-examples of_____?
Given the data, what was the testable question?
What variable is being tested?
What is the control group?
What procedure would you use?

Levels of Depth of Knowledge for Science
Adapted from the Florida Interim Assessment Item Bank and Test Platform

Level 3
Strategic Thinking…

requires reasoning, planning, using evidence, and complex and abstract thinking. The complexity results from there being multiple correct responses in which student justification is necessary and thorough. Level 3 asks students to cite evidence when developing a logical argument and to explain scientific phenomena in terms of concepts.

Some Examples of Level 3 Performance

- Design and execute an experiment or systematic observation to test a hypothesis or research question.
- Design and develop a scientific model to explain a scientific concept or theory.
- Form conclusions from experimental data.
- Cite evidence for scientific theory (e.g., energy is neither lost nor created within food chains and electrical circuits).
- Compare information within or across data sets (several monthly temperature graphs of the same city).
- Explain how political, social, and economic concerns can affect science, and vice versa.
- Explain the properties of the sun and its position within the solar system and then connect this knowledge to the condition and events occurring on Earth.

Question Stems

What conclusions can you draw?
How would you test_____?
What would the outcome be if_____?
What features of the graph should be considered when_____?
What question could we ask now?
What evidence should be considered?
Explain your thinking when there is more than one answer. Elaborate.
Formulate a reason as to why_____?
Which facts support _____?
What is the best answer? Why?
How would you adapt _____ to create a different _____?
How is_____related to_____?

Levels of Depth of Knowledge for Science
Adapted from the Florida Interim Assessment Item Bank and Test Platform

Level 4
Extended Thinking…

requires the same high cognitive demands as Level 3 with the additional requirement that students work over an extended period of time and/or with extended effort. Level 4 assessment items require significant thought.

Some Examples of Level 4 Performance

- Relate scientific concepts to other content areas (e.g., impact of environment changes).
- Develop generalizations of the results obtained and apply them to new situations (e.g., predict the weather in a particular place and time).
- Select or devise an approach among many alternatives for how a situation or problem is to be solved.
- Analyze multiple sources of evidence.
- Apply understanding in a new way, provide argument or justification for the application (e.g., using inertia).
- Conduct an investigation, from specifying a problem to designing and carrying out an experiment and analyzing data and forming conclusions.

Question Stems/Tasks

What information can you gather to support your idea about_____?
Apply information from one text to another text to develop a persuasive argument.
Write a research paper/thesis on a topic from multiple sources.
Judge the value of material for a given purpose.
Consider multiple lines of inquiry to explain a particular scientific theory (e.g., conservation of mass and inertia).
Produce a detailed report of a scientific experiment or systematic observation, and infer conclusions based upon evidence obtained.
Provide time for extended thinking.
Assess through performance and open-ended activities.

Appendix A

Formative Assessment Strategies
Science K-5

Adapted from Page Keeley's *Science Formative Assessment: 75 Practical Strategies for Linking Assessment, Instruction, and Learning*

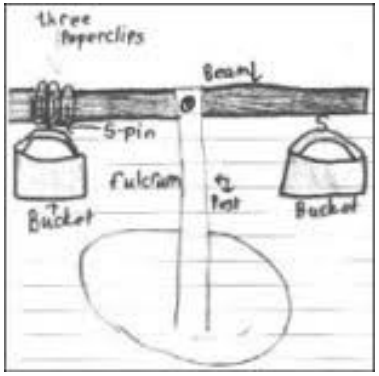
<table>
<tr><th>Strategy Name</th><th>Description</th><th>Additional Information</th></tr>
<tr><td>A & D Statements</td><td>A & D Statements analyze a set of "fact or fiction" statements. First, students may choose to agree or disagree with a statement or identify whether they need more information. Students are asked to describe their thinking about why they agree, disagree, or are unsure. In the second part, students describe what they can do to investigate the statement by testing their ideas, researching what is already known, or using other means of inquiry.</td><td>
<table>
<tr><th>Statement</th><th>How can you find out?</th></tr>
<tr><td>All magnets have 2 poles.
_agree _disagree
_it depends _not sure

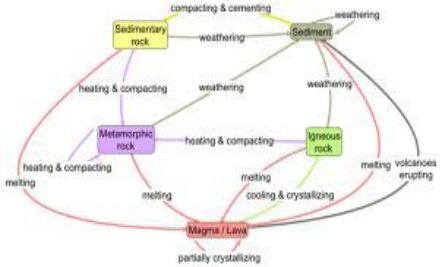
My thoughts:</td><td></td></tr>
</table>
</td></tr>
<tr><td>Agreement Circles</td><td>Agreement Circles provide a kinesthetic way to activate thinking and engage students in scientific argumentation. Students stand in a circle as the teacher reads a statement. While standing, they face their peers and match themselves up in small groups of opposing beliefs. Students discuss and defend their positions. After some students defend their answers, the teacher can ask if others have been swayed. If so, stand up. If not, what are your thoughts? Why did you disagree? After hearing those who disagree, does anyone who has agreed want to change their minds? This should be used when students have had some exposure to the content.</td><td>Energy

1. Energy is a material that is stored in an object.

2. When energy changes from one form to another, heat is usually given off.

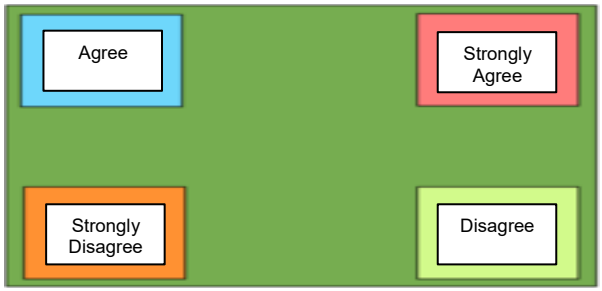
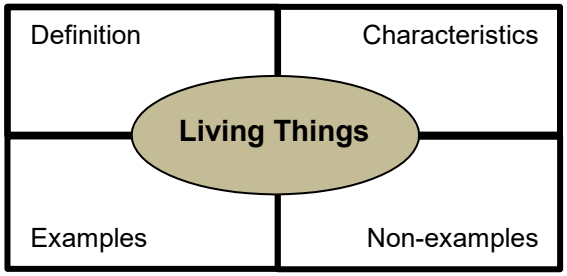
3. Energy can never be created or destroyed.

4. Something has to move in order to have energy.</td></tr>
<tr><td>Annotated Student Drawings</td><td>Annotated Student Drawings are student-made, labeled illustrations that visually represent and describe students' thinking about scientific concepts. Younger students may verbally describe and name parts of their drawings while the teacher annotates them.</td><td> 
</td></tr>
</table>

Strategy Name	Description	Additional Information
Card Sorts	*Card Sorts* is a sorting activity in which students group a set of cards with pictures or words according to certain characteristics or category. Students sort the cards based on their preexisting ideas about the concepts, objects, or processes on the cards. As students sort the cards, they discuss their reasons for placing each card into a designated group. This activity promotes discussion and active thinking.	
Chain Notes	*Chain Notes* is a strategy that begins with a question printed at the top of a paper. The paper is then circulated from student to student. Each student responds with one to two sentences related to the question and passes it on to the next student. A student can add a new thought or build on a previous statement.	**What is Matter?** Matter is all around us. Matter makes up everything. Matter has volume and takes up space. You can feel and see matter.
Commit and Toss	*Commit and Toss* is a technique used to anonymously and quickly assess student understanding on a topic. Students are given a question. They are asked to answer it and explain their thinking. They write this on a piece of paper. The paper is crumpled into a ball. Once the teacher gives the signal, they toss, pass, or place the ball in a basket. Students take turns reading their "caught" response. Once all ideas have been made public and discussed, engage students in a class discussion to decide which ideas they believe are the most plausible and to provide justification for the thinking.	**Solids and Holes** Lance has a thin, solid piece of material. He places it in water. It floats. He takes the material out and punches holes all the way through it. What do you think Lance will observe when he puts the material with holes back in the water? A. It will sink. B. It will barely float. C. It will float the same as it did before the holes were punched. D. It will neither sink nor float. It will bob up and down in the water. Explain your thinking. Describe the reason for the answer you selected.
Concept Card Mapping	*Concept Card Mapping* is a variation on concept mapping. Students are given cards with the concepts written on them. They move the cards around and arrange them as a connected web of knowledge. This strategy visually displays relationships between concepts.	

<table>
<tr><th>Strategy Name</th><th>Description</th><th>Additional Information</th></tr>
<tr><td>Concept Cartoons</td><td>Concept Cartoons are cartoon drawings that visually depict children or adults sharing their ideas about common everyday science.
Students decide which character in the cartoon they agree with most and why. This formative assessment is designed to engage and motivate students to uncover their own ideas and encourage scientific argumentation.
Concept Cartoons are most often used at the beginning of a new concept or skill. These are designed to probe students' thinking about everyday situations they encounter that involve the use of science.
Not all cartoons have one "right answer." Students should be given ample time for ideas to simmer and stew to increase cognitive engagement.</td><td> 
www.pixton.com</td></tr>
<tr><td>Data Match</td><td>Data Match provides students with a data set from a familiar investigation and several statements about data. Students use evidence from the data to determine which statements are accurate. This strategy provides students with an opportunity to consider what constitutes evidence, practice interpreting data, and consider how confident they are in interpreting results of an inquiry.</td><td><table><tr><td>On the blacktop in the sun</td><td>3</td></tr><tr><td>On the blacktop in the shade</td><td>7</td></tr><tr><td>On the grass</td><td>10</td></tr><tr><td>On the metal side</td><td>2</td></tr><tr><td>On the dirt underneath the slide</td><td>5</td></tr></table>Which of these statements match your results?
The ice cube on the grass took longest to melt.
The metal slide was hotter than the dirt underneath the slide.
The ice cube melted faster on the blacktop in the sun than on the shaded blacktop.
Ice placed on dark things melts faster than ice placed on light things.
Ice melts faster on some surfaces than on others.</td></tr>
<tr><td>Fact First Questioning</td><td>Fact First Questioning is a higher-order questioning technique used to draw out students' knowledge. It takes a factual "what" question and turns it into a deeper "how" or "why" question. Teachers state the fact first and then ask students to elaborate, enabling deeper thinking processes that lead to a more enduring understanding of science concepts.</td><td><table><tr><td>Glucose is a form of food for plants.
Why is glucose considered a food for plants?</td></tr><tr><td>A cell is called the basic unit of life.
Why is a cell called the basic unit of life?</td></tr><tr><td>The patterns of stars in the night sky stay the same.
Why do the patterns of stars in the night sky stay the same?</td></tr><tr><td>Sandstone is a sedimentary rock.
Why is sandstone considered a sedimentary rock?</td></tr></table></td></tr>
</table>

<table>
<tr><th>Strategy Name</th><th>Description</th><th>Additional Information</th></tr>
<tr><td>Familiar Phenomenon Probes</td><td>Familiar Phenomenon Probes is a strategy involving two-tiered questions consisting of a selected response section and a justification for the selected response. They engage students in thinking about scientific ideas related to the phenomenon and committing to a response that matches their thinking. The distracters (wrong choices) include commonly held misconceptions that children have in science.</td><td>What's in the Bubbles?
Hannah is boiling water in a glass tea kettle. She notices large bubbles forming on the bottom of the kettle that rise to the top and wonders what is in the bubbles. She asks her family what they think, and this is what they may say:
Dad: They are bubble of heat.
Calvin: The bubbles are filled with air.
Grandma: The bubbles are an invisible form of water.
Mom: The bubbles are empty. There is nothing inside them.
Lucy: The bubbles contain oxygen and hydrogen that separated from the water.
Which person do you most agree with and why? Explain your thinking.</td></tr>
<tr><td>First Word-Last Word</td><td>First Word-Last Word is a variation of acrostic poetry. Students construct statements about a concept or topic before and after instruction that begins with the designated letter of the alphabet. The acrostic format provides a structure for them to build their idea statements off different letters that make up the topic word.</td><td>
<table>
<tr><th>First Word-Photosynthesis</th><th>Last Word-Photosynthesis</th></tr>
<tr><td>Plants make their own food.</td><td>Producers such as plants use energy from the sun to make their food.</td></tr>
<tr><td>Happens in cells</td><td>Happens in cells that have structures called chloroplasts</td></tr>
<tr><td>Other animals eat plants.</td><td>Organisms that eat plants are using energy from the plant.</td></tr>
<tr><td>The roots take up food and water.</td><td>The roots take water up to the leaves where it reacts with sunlight and carbon dioxide.</td></tr>
<tr><td>Oxygen is breathed in through leaves.</td><td>Oxygen is given off during photosynthesis and is used by plants and animals for respiration.</td></tr>
<tr><td>Sunlight makes food for plants.</td><td>Sunlight provides the energy so plants can make food.</td></tr>
<tr><td>You can't make your own food.</td><td>You need to have cells with chloroplast and chlorophyll to make food.</td></tr>
<tr><td>Needs water, sunlight, oxygen, and minerals</td><td>Needs water, carbon dioxide and sunlight to make food</td></tr>
<tr><td>The leaves, roots, and stems are all parts that make food.</td><td>The leaf is the food making part.</td></tr>
<tr><td>Have to have sun and water</td><td>Have to have sunlight, water, and carbon dioxide</td></tr>
<tr><td>Energy comes from the sun.</td><td>Energy comes from sunlight.</td></tr>
<tr><td>Sunlight turns plants green.</td><td>Sunlight is trapped in the chlorophyll.</td></tr>
<tr><td>It happens in all plants.</td><td>It is necessary life process for all plants.</td></tr>
<tr><td>Soil is used by plants to make food.</td><td>Soil holds the water for plants and gives some minerals.</td></tr>
</table>
</td></tr>
</table>

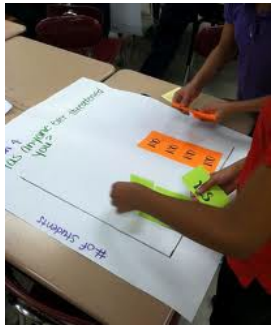
Strategy Name	Description	Additional Information
Fist to Five	*Fist to Five* asks students to indicate the extent of their understanding of a scientific concept by holding up a closed fist (no understanding), one finger (very little understanding), and a range up to five fingers (understand completely and can easily explain it to someone else). Fist to Five provides a simple feedback opportunity for all students in a class to indicate when they do not understand a concept or skill and need additional support for their learning.	
Four Corners	*Four Corners* is a kinesthetic strategy. The four corners of the classroom are labeled: Strongly Agree, Agree, Disagree and Strongly Disagree. Initially, the teacher presents a science statement to students and asks them to go to the corner that best aligns with their thinking. Students then pair up to defend their thinking with evidence. The teacher circulates and records student comments. Next, the teacher facilitates a whole group discussion. Students defend their thinking and listen to others' thinking before returning to their desks to record their new understanding.	
Frayer Model	*Frayer Model* is a strategy that graphically organizes prior knowledge about a concept into an operational definition, characteristics, examples, and non-examples. It provides students with the opportunity to clarify what they are thinking about the concept and to communicate their understanding.	
Friendly Talk Probes	*Friendly Talk Probes* is a strategy that involves a selected response section followed by justification. The probe is set in a real-life scenario in which friends talk about a science-related concept or phenomenon. Students are asked to pick the person they most agree with and explain why. This can be used to engage students at any point during a unit. It can be used to access prior knowledge before the unit begins or assess learning throughout and at the close of a unit.	**Talking about Gravity** Two friends are talking about gravity. Ben says, "Gravity needs atmosphere or air. If there is no air or atmosphere, there will be no gravity." Kelly says, "Gravity doesn't need an atmosphere or air. If there is no air or atmosphere, there will still be gravity." Which friend do you agree with?_____ Describe your thinking. Explain why you agree with one friend and disagree with the other.

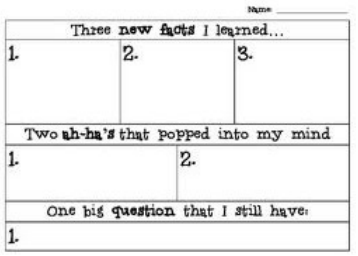
<table>
<tr><th>Strategy Name</th><th>Description</th><th>Additional Information</th></tr>
<tr><td>Give Me Five</td><td>Give Me Five is a simple, quick technique for inviting and valuing public reflection and welcoming feedback from the students. Students should be given time to quietly reflect, perhaps through a quick write. Teacher selects five “volunteers” to share their reflection.

NOTE: Deliberately select students for reinforcing correct understanding and addressing misconceptions.</td><td>1. What was the most significant learning you had during today’s lesson?
2. How “in the zone” do you feel right now as far as understanding the concept?
3. How did today’s lesson help you better understand the concept?
4. What was the high point of this week’s activities on the concept?
5. How well do you think today’s science discussion worked in improving your understanding of the concept?</td></tr>
<tr><td>Human Scatterplot</td><td>Human Scatterplot is a quick, visual way for teacher and students to get an immediate classroom snapshot of students’ thinking and the level of confidence students have in their ideas. Teachers develop a selective response question with up to four answer choices. Label one side of the room with the answer choices. Label the adjacent wall with a range of low confidence to high confidence. Students read the question and position themselves in the room according to their answer choice and degree of confidence in their answer.</td><td> 
</td></tr>
<tr><td>I Used to Think…
But Now I Know…</td><td>I Used to Think…But Now I Know is a self-assessment and reflection exercise that helps students recognize if and how their thinking has changed at the end of a sequence of instruction. An additional column can be added to include…And This Is How I Learned It to help students reflect on what part of their learning experiences helped them change or further develop their ideas.</td><td><table><tr><th>I USED TO THINK…</th><th>BUT NOW I KNOW…</th></tr><tr><td></td><td></td></tr></table></td></tr>
<tr><td>Justified List</td><td>Justified List begins with a statement about an object, process, concept or skill. Examples that fit or do not fit the statement are listed. Students check off the items on the list that fit the statement and provide a justification explaining their rule or reasons for their selections.
This can be done individually or in small group. Small groups can share their lists with the whole class for discussion and feedback.
Pictures or manipulatives can be used for English-language learners.</td><td><table><tr><th>Making Sound</th></tr><tr><td>All of the objects listed below make sounds.
Put an X next to the objects you think involve vibration in producing sound.</td></tr><tr><td>____guitar strings ____drum ____piano
____dripping faucet_____flute ____wind
____hammer ____crumpled paper
____thunderstorm ____barking dog
____screeching brakes</td></tr><tr><td>Explain your thinking. What “rule” or reasoning did you use to decide which objects involve vibration?</td></tr></table></td></tr>
</table>

<table>
<tr><th>Strategy Name</th><th>Description</th><th>Additional Information</th></tr>
<tr><td>K-W-L Variations</td><td>K-W-L is a general technique in which students describe what they Know about a topic, what they Want to know about a topic, and what they have Learned about the topic. It provides an opportunity for students to become engaged with a topic, particularly when asked what they want to know. K-W-L provides a self-assessment and reflection at the end, when students are asked to think about what they have learned. The three phrases of K-W-L help students see the connections between what they already know, what they would like to find out, and what they learned as a result.</td><td><table><tr><th>K
This is what I already KNOW</th><th>W
This is what I WANT to find out</th><th>L
This is what I LEARNED</th></tr><tr><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>Learning Goals Inventory (LGI)</td><td>Learning Goals Inventory (LGI) is a set of questions that relate to an identified learning goal in a unit of instruction. Students are asked to “inventory” the learning goal by accessing prior knowledge. This requires them to think about what they already know in relation to the learning goal statement as well as when and how they may have learned about it. The LGI can be given back to students at the end of the instructional unit as a self-assessment and reflection of their learning.</td><td><table><tr><th>What do you think the learning goal is about?</th></tr><tr><td>List any concepts or ideas you are familiar with related to this learning goal.</td></tr><tr><td>List any terminology you know of that relates to this goal.</td></tr><tr><td>List any experiences you have had that may have helped you learn about the ideas in this learning goal.</td></tr></table></td></tr>
<tr><td>Look Back</td><td>Look Back is a recount of what students learned over a given instructional period. It provides students with an opportunity to look back and summarize their learning. Asking the students “how they learned it” helps them think about their own learning. The information can be used to differentiate instruction for individual learners, based on their descriptions of what helped them learn.</td><td><table><tr><th>What I Learned</th><th>How I Learned it</th></tr><tr><td></td><td></td></tr></table></td></tr>
<tr><td>Muddiest Point</td><td>Muddiest Point is a quick-monitoring technique in which students are asked to take a few minutes to jot down what the most difficult or confusing part of a lesson was for them. The information gathered is then to be used for instructional feedback to address student difficulties.</td><td>Scenario: Students have been using a hand lens to make observations of the details on a penny. Teacher states, “I want you to think about the muddiest point for you so far when it comes to using a hand lens. Jot it down. I will use the information you give me to think about ways to help you better use the hand lens in tomorrow’s lesson.”</td></tr>
</table>

<table>
<tr><th>Strategy Name</th><th>Description</th><th>Additional Information</th></tr>
<tr><td>Odd One Out</td><td>Odd One Out combines similar items/terminology and challenges students to choose which item/term in the group does not belong. Students are asked to justify their reasoning for selecting the item that does not fit with the others. Odd One Out provides an opportunity for students to access scientific knowledge while analyzing relationships between items in a group.</td><td>Properties of Matter: In each set, circle the Odd One Out and describe why it does not fit with the others.
<table><tr><th>Which Is the Odd One?</th><th>Why Is It the Odd One Out?</th></tr><tr><td>weight
density
length
color</td><td></td></tr></table></td></tr>
<tr><td>Paint The Picture</td><td>Paint the Picture visually depicts students’ thinking about an idea in science without using any annotations. This involves giving the students a question and asking them to design a visual representation that reveals their thinking and answers the question. Paint the Picture provides an opportunity for students to organize their thinking and represent their thinking in a creative, unique visual format.</td><td>What role do minerals play in the formation of a rock?
minerals → →  rock</td></tr>
<tr><td>Partner Speaks</td><td>Partner Speaks provides students with an opportunity to talk through an idea or question with another student before sharing with a larger group. When ideas are shared with the larger group, pairs speak from the perspective of their partner’s ideas. This encourages careful listening and consideration of another’s ideas.</td><td>Today we are going to investigate how objects float and sink in water.
- What do you think affects whether an object floats or sinks in water?
- What can you do to change how an object floats or sinks?
Turn to your partner and take turns discussing ideas.</td></tr>
<tr><td>Pass the Question</td><td>Pass the Question provides an opportunity for students to collaborate in activating their own ideas and examining other students’ thinking. Students begin by working together in pairs to respond to a question. Time is allotted for partial completion of their responses. When the time is up, they exchange their partially completed response with another pair. Students are provided time to finish, modify, add to, or change it as they deem necessary. Pairs then group to give feedback to each other on the modifications.</td><td>What are the phases of the moon?
Can sound travel through a solid?
What is the difference between temperature and humidity?
Are science tools helpful?
How can you measure matter?</td></tr>
<tr><td>A Picture Tells a Thousand Words</td><td>A Picture Tells a Thousand Words is a technique where students are digitally photographed during an inquiry-based activity or investigation. They are given the photograph and asked to describe and annotate what they were doing and learning in the photo. Images can be used to spark student discussions, explore new directions in inquiry, and probe their thinking as it relates to the moment the photograph was taken.</td><td>  </td></tr>
</table>

Strategy Name	Description	Additional Information
Question Generating	*Question Generating* is a technique that switches roles from the teacher as the question generator to the student as the question generator. The ability to formulate good questions about a topic can indicate the extent to which a student understands ideas that underlie the topic. This technique can be used any time during instruction. Students can exchange or answer their own questions, revealing further information about the students' ideas related to the topic.	**Question Generating Stems:** • Why does_ _? • How does_ _? • What if___? • What could be the reason for___? • What would happen if _? • How does _compare to _? • How could we find out if___?
Sticky Bars	*Sticky Bars* is a technique that helps students recognize the range of ideas that students have about a topic. Students are presented with a short answer or multiple-choice question. The answer is anonymously recorded on a Post-it note and given to the teacher. The notes are arranged on the wall or whiteboard as a bar graph representing the different student responses. Students then discuss the data and what they think the class needs to do in order to come to a common understanding.	
Thinking Logs	*Thinking Logs* is a strategy that informs the teacher of the learning successes and challenges of individual students. Students choose the thinking stem that would best describe their thinking at that moment. Provide a few minutes for students to write down their thoughts using the stem. The information can be used to provide interventions for individuals or groups of students as well as match students with peers who may be able to provide learning support.	□ I was successful in… □ I got stuck… □ I figured out… □ I got confused when…so I… □ I think I need to redo… □ I need to rethink… □ I first thought…but now I realize… □ I will understand this better if I… □ The hardest part of this was… □ I figured it out because… □ I really feel good about the way…
Think-Pair-Share	*Think-Pair-Share* is a technique that combines thinking with communication. The teacher poses a question and gives individual students time to think about the question. Students then pair up with a partner to discuss their ideas. After pairs discuss, students share their ideas in a small-group or whole-class discussion. (Kagan) NOTE: Varying student pairs ensures diverse peer interactions.	 

<table>
<tr><th>Strategy Name</th><th>Description</th><th>Additional Information</th></tr>
<tr><td>Traffic Light Cups</td><td>Traffic Light Cups is a monitoring strategy that can be used at any time during instruction to help teachers gauge student understanding. The colors indicate whether students have full, partial, or minimal understanding. Students are given three different-colored cups, asked to self-assess their understanding about the concept or skill they are learning, and display the cup that best matches their understanding.</td><td><table><tr><td>Green</td><td>I understand this very well.</td></tr><tr><td>Yellow</td><td>I understand most of it but could use a little help.</td></tr><tr><td>Red</td><td>Help. I don’t get it.</td></tr></table></td></tr>
<tr><td>Two-Minute Paper</td><td>Two-Minute Paper is a quick way to collect feedback from students about their learning at the end of an activity, field trip, lecture, video, or other type of learning experience. Teacher writes two questions on the board or on a chart to which students respond in two minutes. Responses are analyzed, and results are shared with students the following day.</td><td>• What was the most important thing you learned today?
• What did you learn today that you didn’t know before?
• What important question remains unanswered for you?
• What would help you learn better tomorrow?</td></tr>
<tr><td>Two Stars and a Wish</td><td>Two Stars and a Wish is a way to balance positive and corrective feedback. The first sentence describes two positive commendations for the student’s work. The second sentence provides one recommendation for revision. This strategy could be used teacher-to-student or student-to-student.</td><td> 
</td></tr>
<tr><td>3-2-1</td><td>3-2-1 is a technique that provides a structured way for students to reflect upon their learning. Students respond in writing to three reflective prompts. This technique allows students to identify and share their successes, challenges, and questions for future learning. Teachers have the flexibility to select reflective prompts that will provide them with the most relevant information for data-driven decision making.</td><td>Sample 1
☐ 3 – Three key ideas I will remember
☐ 2 – Two things I am still struggling with
☐ 1 – One thing that will help me tomorrow
Sample 2
 
</td></tr>
</table>

GLOSSARY OF TERMS

The Science Curriculum Map has been developed by teachers for ease of use during instructional planning. Terminology found within the framework of the curriculum map is defined below.

Next Generation Sunshine State Standards (NGSSS): a set of content and process science standards that define with specificity what teachers should teach and students should know and be able to do; adopted by the Florida State Board of Education in 2008

NGSSS Body of Knowledge: the broadest organizational structure used to group content and concepts within the curriculum map and include the following: Nature of Science, Earth Science, Physical Science and Life Science (also known as *Reporting Category*)

Standard/Big Idea: an overarching organizational structure used to describe the scope of a selected group of benchmarks; *for example, The Characteristics of Science Knowledge, Earth Systems and Patterns, Forms of Energy, and Interdependence*

Unit of Study: an overarching organizational sub-structure comprised of a collection of topics used to group content and concepts for a narrower focus

Topics: a grouping of benchmarks and skills that form a subset of scientific concepts covered in each unit of study

Benchmarks: the required NGSSS expectations presented in the course descriptions posted on CPALMS by FLDOE

Learning Targets/Skills: the content knowledge, processes, and enabling skills that will ensure successful mastery of the benchmarks

Vocabulary: the content terminology and other academic language and phrases that support mastery of the learning targets and skills; for teacher- and student-use alike

Pacing: a recommendation of time frames for initial delivery of instruction and assessment

Teacher Hints: a listing of considerations when planning for instruction; may include suggestions or ideas for review

Resource Alignment: a listing of available, high quality and benchmark-aligned materials including labs, strategies, lessons, and videos from textbook and other media sources

Formative Assessment Strategies: techniques that can be used before, during, and after instruction to evaluate student learning

The District Math and Science Dept. recommends that all students engage in hands-on, minds-on science experiences DAILY.