SCOPE & SEQUENCE CREATED BY TEACHERS FOR THE TEACHERS OF SRC

SANTA ROSA
COUNTY DISTRICT SCHOOLS

“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

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How to Use This Planning Tool

The Scope and Sequence has been created by the Math & Science Department and a team of SRC teachers to help planning meaningful instruction of science content. The progression of content, organized into units, is based upon the course description provided by the FLDOE and the team.

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 Grade 3 Science instruction: The content of the Grade 3 Scope and Sequence is not only to be utilized in preparation for the Statewide Science Assessment. Rather, the content covered in Grade 3 lays the foundational framework for future science study and is crucial to success in the middle and high school grades. In addition, science instruction utilizing the 5E and/or inquiry-based modes of instruction encourage independent, critical thinking and application.

NSTA states that "Elementary school 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).

Third Grade Overview

Third Grade focuses instructional delivery for science within the following eleven (11) Big Ideas/Standards:
The concepts highlighted (and in italics) **are newly introduced this year.**

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

- Observations
- Keeping records (pictorial and *written*)
- Compare observations with others
- Draw conclusions based on evidence (How do you know?)
- Raise questions
- Use systematic observations
- Justify conclusions based on evidence
- Observations vs. inferences
- *Seek reasons to explain differences in data*
- *Keeping records (charts/graphs)*
- *Infer based on evidence*
- *Empirical evidence*
- *Science involves creativity in designing experiments*

Big Idea 3 – The Role of Theories, Laws, Hypotheses, and Models

- *ScienceSpeak is different from common usage*
- *Using models/models do not perfectly account for all observations*

<u>Earth and Space Science:</u>

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
- Gravity works even though nothing is touching the object
- Stars are infinite
- Magnifiers (telescopes)
- Benefits/dangers of the Sun
- *Stars/telescopes*
- *Sun*
- *Gravity is a force that can be overcome*

Big Idea 6 – Earth Structures

- Things found on Earth's surface (living and nonliving)
- Water is a basic need/water safety
- Some things happen fast, some things happen slowly
- Earth composed of rocks of many shapes/sizes
- Process of soil formation/composition of soil
- Classify soil
- *Sun heats Earth in day, Earth loses heat at night*

Physical Science:

Big Idea 8 – Properties of Matter

- Sort by: size, shape, color, temperature, (hot, cold), weight (heavy/light), texture, and sink and float
- Sort by attraction of magnets
- Measuring properties (especially temperature and volume)
- States of matter (especially water)
- *Compare based on properties (adds hardness)*
- *Measure/compare temps of solids and liquids*
- *Measure/compare mass/volume*

Big Idea 9 – Changes in Matter

- Physical changes to paper and clay (cutting, tearing, crumpling, smashing, rolling)
- Physical changes don't always affect objects in the same ways
- *Water changes state + terminology (melting, freezing, boiling, evaporation, condensation)*

Big Idea 10 – Forms of Energy

- Things that make sound vibrate
- People use energy to improve their lives
- *Basic **forms** of energy (light, heat, sound, electrical, mechanica)*
- *Energy can cause/change motion*
- ***FOCUS**: light energy*

Big Idea 11 – Energy Transfer and Transformation

- *Light energy also gives off heat*
- *Friction produces heat*

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)
- Using senses to make observations
- Major parts of plants
- Living vs. non-living
- Human body parts (brain, heart, lungs, stomach, muscles, skeleton) and functions
- Structures in plants and functions (support, reproduction, nutrient transport, food production
- Plants respond to stimuli (heat, light, gravity)

Big Idea 15 – Diversity and Evolution of Living Organisms

- *Classification of animals by physical characteristics (vertebrates/invertebrates, major classes – mammals, reptiles, arthropods, etc.)*
- *Classification of behavior*
- *Classification of plants by physical characteristics (flowering/non-flowering, seed-producer/spore producer)*

Big Idea 17 – Interdependence

- Basic needs of plants and animals
- Basic needs of humans compared to other animals and plants
- Living things are all over Earth, but each must have a habitat that meets its basic needs
- *Animals/plants response to changing seasons*
- *Plants use energy from sun to make own food (producers)*

Santa Rosa County Science
Teacher's 3rd Grade Suggested Instructional Scope and Sequence

1st Quarter	Week 1 – 3	Week 4 – 7	Week 8 – 10
	Nature of Science	**Matter & Its Properties**	**Energy**
	Embedded in text – as an introduction, teach basic skills, collaboration techniques, and team building exercises Specific activities found in NOS Handbook at end of text	**Topic 2 in text: Lesson 2 & 3 (Lesson 1 Enrichment)** Big Ideas: Properties of and Changes in Matter *Standards:* **SC.3.P.8.1** (measure and compare materials); **SC.3.P.9.1** (describe the changes in water) ENRICHMENT: SC.3.P.8.3 (Law of Conservation of Mass) – **Not Assessed – Lesson 1;** SC.3.P.8.2 (properties and common uses of water in its states) – **Not Assessed – Lesson 2 (part)**	**Topic 3: Lessons 1 and 2** Big Ideas: Forms of Energy and Energy Transfer and Transformations *Standards:* **SC.3.P.10.1** (identify basic forms of energy); **SC.3.P.10.2** (recognize that energy can cause motion or create change);

2nd Quarter	Week 10	Week 11 – 13	Week 14 – 18
	Energy – cont.	**Heat & Light**	**The Universe**

<table>
<tr><td></td><td>Topic 3 Lessons 1 & 2 in text
Big Ideas: Forms of Energy and Energy Transfer and Transformations
Standards cont: SC.3.P 11.2 (investigate, observe and explain that heat is produced by friction)</td><td colspan="3">Topic 3: Lessons 1 and 2
Big Ideas: Forms of Energy and Energy Transfer and Transformations
Standards: SC.3.P.10.3 (demonstrate how light travels);
SC.3.P.10.4 (demonstrate that light can be reflected, refracted and absorbed); SC.3.P.11.1 (investigate, explain, observe that things may give off heat when they give off light)</td><td colspan="6">Topic 1 in Text
Big Ideas: Earth in Space & Time and Earth Structures
Standards: SC.3.E.5.1(explain perspective of stars); SC.3.E.5.2 (identify that energy (and light) comes from the Sun); SC.3.5.3 (recognize why the Sun is large and bright); SC.3.E.6.1 (demonstrate how Sun's energy heats objects when present)
ENRICHMENT: SC.3.E.5.5 (investigate how using a telescope increases the number of starts seen) – Not Assessed - Lesson 1 (part)</td></tr>
<tr><td>3rd Quarter</td><td colspan="5">Week 19 – 23</td><td colspan="5">Week 24 – 28</td></tr>
<tr><td></td><td colspan="5">Plants</td><td colspan="5">Living Things & Their Environment</td></tr>
<tr><td></td><td colspan="5">Topic 4 in text
Big Ideas” Organization & Development of Living Organisms and Interdependence
Standards: SC.3.L.14.1 (describe plant structures and their functions); SC.3.L.17.2 (recognize that plants use energy to make food); SC.3.L.14.2 (investigate & describe plant's response to stimuli)</td><td colspan="5">Topic 5 in text
Big Ideas” Organization & Development of Living Organisms and Interdependence
Standards: SC.3.L.15.2 (classify plants); SC.3.L.15.1 (classify animals); SC. 3.L.17.1 (describe seasonal change responses of plants and animals)</td></tr>
<tr><td>4th Quarter</td><td>Week 29</td><td>Week 30</td><td>Week 31</td><td>Week 32</td><td>Week 33</td><td>Week 34</td><td>Week 35</td><td>Week 36</td><td>Week 37</td><td>Week 38</td></tr>
<tr><td></td><td colspan="5">Catch - up</td><td colspan="5">Putting it ALL together
ENRICHMENT</td></tr>
<tr><td></td><td colspan="10">Finding the gaps, catching up, and putting it all together</td></tr>
</table>

Third Grade Suggested Scope and Sequence			
NGSS Body of Knowledge: Nature of Science/Life Science Unit of Study: The Practice of Science (3 weeks)			
Prerequisite Learning: Kindergarten – SC.K.N.1.1, SC.K.N.1.2, SC.K.N.1.3, SC.K.N.1.4, SC.K.N.1.5 **First Grade – SC.1.N.1.1, SC.1.N.1.2, SC.1.N.1.3, SC.1.N.1.4, SC.1.E.5.3** **Second Grade – SC.2.N.1.1, SC.2.N.1.2, SC.2.N.1.3, SC.2.N.1.4, SC.2.N.1.5, SC.2.N.1.6**			
Topics	Learning Targets/Skills	Standard(s)	Vocabulary
The Practice of Science **This is embedded in text and should be done as an introduction to skills needed in the science classroom.** **Specific NOS activities are found in the NOS handbook at the end of the text.**	**Note:** Learning Targets beginning with **"review"** indicate instruction from previous grades. *Infer based on observation.* ***Students will:*** • **explore** answers to questions such as "What is science?", "What do scientists' study?", and "What does a scientist look like?". • **organize** a science notebook that will be used all year by students to reflect a partial record of what is being learned. • **predict** the identity of a mystery (unknown) event/object/substance before making extensive observations. • **make** observations of a mystery event/object/substance. • **make** inferences based on observations of the mystery event/object/substance. • **justify** inferences made (reasons for results of the scientific study of the event/object/substance). • **discuss** the importance of observations when making inferences.	**SC.3.N.1.6**	**infer/inference** **observe/observation** **predict/prediction** **science** **science notebook** **scientist**
	Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups. ***Students will:*** ○ **match** each tool to its function or purpose. ○ **use** scientific tools (e.g., goggles, gloves, hand lens, microscopes, balance, scale, ruler, tape measure, metric stick, graduated cylinder, beaker, stopwatch, thermometer, eyedropper, magnets) during an investigation. ○ **record** observations during the investigation. ○ **summarize** observations made by two different groups who have conducted the same investigation using the same tools.	**SC.3.N.1.2**	**mass (weight)** **scientific tools** ○ balance scale ○ beaker ○ eyedropper ○ flask ○ forceps ○ gloves ○ goggles ○ graduated cylinder ○ hand lens ○ magnet ○ measuring cup ○ meter stick ○ metric ruler ○ microscope

	○ **compare** observations (similarities and differences) made by two different groups using the same tools. **explain** why there maybe differences in observations between groups (e.g., human error in use and in measuring, use of the same kind of tool but a different one is used).		○ spring scale ○ stopwatch ○ tape measure ○ thermometer **temperature** **time** **volume**
Topics	Learning Targets/Skills	Standard(s)	Vocabulary

Work Like a Scientist
 	
&
 	
Technology & Our World
	Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
	Students will:
	• **generate** testable questions about the world around them (e.g., "What happens when…?, "What if…?", "What affects …?", and "How do objects compare?").
	• **form** a hypothesis before investigating a student-generated question.
	• **investigate** testable, student-generated questions through free exploration and teacher- designed investigations using a procedure (steps).
	• **compare** free-exploration investigations to more formal explorations (e.g., teacher-directed, use of the scientific method).
	• **use** the steps of the scientific method (testable question, hypothesis, experiment-materials and procedure, data/evidence, results, conclusion).
	• **generate** appropriate explanations based on observations (data) collected during the exploration/investigation.
	• **explain** why scientists perform multiple trials to gather evidence to support conclusions.
		SC.3.N.1.1	**compare**
			explanation
			explore
			interpret
			investigate
			observations
			prediction
			record
			scientific method
			• testable question
			• hypothesis
			• experiment
			  • materials
			  • procedure
			• data/evidence
			• results
			• conclusion
			trials

	Recognize that scientists use models to help understand and explain how things work. *Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations.* ***Students will:*** • **explain** that models can be three dimensional (figurine, sculpture, toy), two dimensional (diagram, illustration, sketch), a visualization in your mind, or a computer model. • **compare** a model of an object with the real object by siting similarities and differences (e.g., earthworm vs. a gummy	**SC.3.N.3.2** **SC.3.N.3.3**	**2-dimensional model** **3-dimensional model**

	worm, toy car vs. a real car, or a model train vs. a real train). • **explain** how some models will be made from different materials than the real object. • **explain** how some models are larger than the real object while other models are smaller than the real object. • **explain** that not all models account perfectly for all attributes of real objects. • **use and/or construct** different kinds of models when investigating. • **discuss** why scientists use models (to help understand and explain how things work).		
	Explain that empirical evidence is information, such as observations or measurements that is used to help validate explanations of natural phenomena. *Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.* ***Students will:*** • **define** empirical evidence (data which is acquired through careful observation using the five senses and scientific tools that enhance the senses). • **discuss** with a partner or in small groups an appropriate way to collect data for a teacher- selected investigation. • **construct** an appropriate data collection tool (e.g., chart, table) that could be used during the investigation. • **record** data collected during the investigation in science notebooks (e.g., written, pictorial, simple charts/graphs). • **display** data collected in a bar graph (if appropriate) and present to classmates. • **analyze and interpret** data collected during the investigation to formulate an explanation of the results. • **explain** the importance of good record keeping (used to form explanations). *Recognize that scientists' question, discuss, and check each other's evidence and explanations.* *Recognize the importance of communication among scientists.* ***Students will:*** • **identify** ways that scientists share their knowledge and results with one another (e.g., lab reports, journals, articles, conversations). • **describe** why and how scientists collaborate to gain new	**SC.3.N.1.7** **SC.3.N.1.3** **SC.3.N.1.5** **SC.3.N.1.4**	**accuracy** **communication** **compare** **conclusions** **data (evidence)** **interpret** **models** **observations** **predictions** **questions**

	knowledge or refine ideas (e.g., laboratories, field stations, conferences). • **collaborate** with another lab group to question, discuss, and check others' evidence and explanations to demonstrate the importance of communicating with other scientists. • **recognize** the importance of checking evidence for accuracy. • **provide** reasoning as to why scientists may differ in their evidence and explanations (e.g., use of different kinds of tools, consistency in using the same tool for an experiment, human error, living in different parts of the world). • **explain** that explanations of results can vary even when scientists are analyzing the same evidence (i.e., scientists drawing their own conclusions based on the data).		

Resource Alignment	Introduction to Science	Introduction to Science Process	Introduction to Data
Content Limits for Standard	Items will not require the identification or evaluation of a hypothesis. Items should not use the term hypothesis. Items will not require the design of a procedure. Items will not require mathematical computations. Items will not require the differentiation between outcome variables (dependent variables) and test variables (independent variables). Items will not assess the reason for differences in data across groups that are investigating the same problem. Items referring to conclusions will not require the formation of a conclusion	Items will not assess steps or order of scientific method.	Items may use the terms accurate and/or valid in context but should not assess these terms or the difference between these terms.
Daily and Key Questions	***What is a good observation?*** *good observations involve using one or more of the senses (sight, smell, touch, hearing, and taste) to perceive properties of objects and events. Sometimes precautions should be taken before touching, tasting, smelling or tasting, but using more senses produce better observations. Observations can be done directly with the senses or indirectly using simple or complex instruments (e.g. hand lens or microscope)*	***How Can You Use a Model?*** *How is an investigation different from experimentation? an investigation is a procedure carried out to observe a response to a stimulus, but it is not a complete experiment. In an experiment, a procedure is carried out and repeated under controlled conditions to discover, demonstrate or test a hypothesis. Experiments include all the components of the scientific method*	***How Can Scientists Use Tools?*** ***How Can you Measure Length?*** ***How Do Your Results Compare?*** ***What is empirical evidence and how does it help improve explanations by scientists?*** *empirical evidence is gained by observation by the senses, or experience through experimentation.*

	Why is it important to repeat an experimental procedure more than once? *doing an experiment only once without repeating it again to see if the results turn out the same does not verify the outcome. When an experimental procedure is repeated with the same outcome, the results have more validity* ***What is an inference?*** *an inference is an explanation based on your prior experience rather than observing something directly or observations alone*	*including: identifying a problem, collecting background information, forming a hypothesis, designing an experiment, performing the experiment, drawing conclusions, communicating the results, and explaining real-life applications.* ***What is a scientific model?*** *a scientific model is a simplified version of a part or event in nature. Models explain what that part or event looks like and how it works. Scientists make physical models to represent things that cannot be observed directly. Drawings, diagrams, objects, mathematical equations, and computer simulations can be scientific models. Sometimes it is helpful to develop a model to explain what you find out in an experiment. As scientists conduct more experiments, they gain new information about relationships that can be used to update and improve existing models* ***What is a scale model?*** *a scale model is a model that is a miniature of the actual part in size or shape. A scale model is made by measuring the actual part and converting those measurements into proportional values in a smaller denomination to make an exact miniature*	*observation and experimentation is central to the scientific method and make up the facts around how something works* ***What are the science process skills?*** *the science process skills include: observing, comparing, measuring, classifying, inferring, gathering, recording and displaying data, predicting, planning and conducting simple investigations* ***How do scientists affect society?*** *scientists work in many different jobs in our society, but their role is similar: to solve problems. The methods they use are also similar. Through inquiry and the scientific method, scientists investigate problems by observing, questioning, predicting, experimenting, collecting data, analyzing their findings, and making conclusions based on evidence. Sometimes the knowledge they learn may be applied immediately to solve a problem, but more often it is only after the accumulation of the findings of many individuals or teams that other problems can be solved* ***How do scientists communicate?*** *scientists communicate the results of their investigations to other scientists orally, in written words, with diagrams, maps, graphs, measurements, mathematical equations, and many kinds of visual displays and demonstrations* ***Why do scientists communicate their results?*** *communicating their results with others gives scientists a*

			chance to see if any mistakes were made in their experimental design, calculations, or analysis. Sharing results improves the quality of their work and may also provide new ideas for other topics to investigate
Supplemental Literature	A History of Super Science: Atoms and Elements by Andrew Solway, Raintree, 2006One Giant Leap: The Story of Neil Armstrong by Don Brown, Houghton Mifflin, 1998		
Teacher Hints	• Digital textbook resources can be accessed through V-Portal or at www.thinkcentral.com. See page 50 for access information. • A science notebook may take the form of a spiral bound notebook, composition notebook, or 3-ring binder that is organized by topic. Students refer to the pages in this notebook as content reference. • Prediction vs. Hypothesis: A prediction is a statement about what may happen next. This statement is based on some knowledge of the topic because of previous data collected. A hypothesis is a scientific statement that explains an expected outcome based on prior knowledge and information gained through research. • Observations are data or evidence collected using the 5 senses and scientific tools. Data may be quantitative (numbers or measurements) and/or qualitative (describing) in in nature. Purposely plan to make observations of one object or event over an extended period. For example, make observations throughout the school year of a tree that responds to the changing of the seasons. • An inference is a statement that appears to be true based on previous experiences or a collection of	• When evaluating a hypothesis based on the results of an investigation, discourage students from making the claim that their hypothesis is either right or wrong. Encourage by asking them to evaluate their hypothesis as either being supported or not supported by the data. An explanation as to why or why not is to follow the statement of support. • Introduction of the term *variable* should be used as it relates to differences that occur in data when using the same tools. • Students will not be assessed on the term *variable* or will they be asked to identify variables. • Multiple trials mean to either go through the experimental procedure several times or to conduct tests on multiple subjects at once. Multiple trials allow you to see whether the results of each test or the trials show consistency. • Use and refer to models during science exploration. Models can be either 2- or 3-dimensional in nature to include diagrams, globes, skeletons, plants, stuffed animals, or any other items that represent real objects. Models can even be a computer simulation or mental model.	• Using common tools allows scientists to communicate with each other accurately, effectively, and efficiently. • The following link provides a lesson integrating literacy and science to teach the "water displacement method": http://www.lessoncorner.com/l/waldorfteacher/LessonsfromAesopsFableTheCrowandthePitcher. • The following link provides a lab that provides an inquiry opportunity on the "water displacement method": http://www.beaconlearningcenter.com/Lessons/2831.htm. • Non-contact infrared thermometer technology is available to investigate temperature of solids. • Sticker aquarium thermometers are also useful for investigating the temperature of solids. • Be sure to include a brief review of °F and °C when introducing thermometers as a tool scientists use.

	observations. The greater the body of evidence, the more an inference appears to be a fact (e.g., if a person eats hamburgers very often, then gains weight, an inference can be made that hamburgers can cause a person to gain weight). • The study of the Nature of Science allows for students to think and act like a scientist. It involves practices we want our students to engage in throughout the year – ask questions, gather data/evidence, analyze the data, and draw and present conclusions. Embed these practices throughout the instruction of science content. • Investigation suggestions for the beginning of the year… • Mystery Photos - View a section of a picture, make observations, infer what the entire picture could be, and then verify by viewing the entire picture. http://sciencespot.net/Media/Starters/Strong/mysphoto1.ppt • Mystery Powders - Predict what will happen to materials (e.g., Instant Snow, sugar or salt, and Aqua Sand) when 1/2 cup of water is added. Record observations before water is added using a hand lens. Observe and record changes in the substances after water is added. • Mystery Bags - Place different objects in several brown lunch bags and seal them tight (consider doubling each bag for durability). Shake and touch the item through the bag to make observations to infer the identity of the mystery object. • Mystery Liquids – Make observations with eyes only to predict the identity of different liquids (e.g., honey, blue dish detergent, corn-vegetable-baby oil,	• When comparing a model with the real thing, students should focus their attention on the size of the model relative to the real thing, on the materials the model is made from, and on how well the model has replicated the real thing.	

	corn/maple syrup, colored water). Infer what the substance may be based upon observations. • Tools and what they measure, including units of measure, will be revisited during the Matter unit. • Teachers are free to choose any topic (e.g., properties and/or changes of matter, heat, light, plants, animals) to explore the science skills and tools introduced during Weeks 1-6 of the curriculum map. This would require looking at the topics to be taught this year. When using an upcoming topic for these weeks, you wouldn't teach the content associated with the topic but rather use the topic to instruct the content of science process.		
Thinking Maps ®	Circle Map (*What Is a Scientist?*) Bubble Map (characteristics of science/ scientist)	Multi-Flow Map (show data)	Multi-Flow Map (to show data) Tree Map (list the data) Flow Map (steps of the process)
Foldables		Tools (flip booklet) Inference vs. Observation (two tab book)	
CPALMS	*Watch and Learn-SeaWorld Classroom Activity* *http://www.cpalms.org/Public/PreviewResourceUrl/Preview/27697*		
Web Resources	*Science Notebooks in the K12 Classroom* *The Scientific Method Song* *Make Me Genius*	Observation Cookie Observations Scholastic Study Jams: *Identify Outcomes and Make Predictions* Brain Pop Jr.: *Scientific Method*	*Science Bob* *Try Science Experiments*
Content Literacy	Oscar and the Snail: A Book About the Things We Use by Geoff Waring, Candlewick, 2009 Big, Bigger, Biggest by Nancy Coffelt, Henry Holt, 2009 Floating and Sinking by Ellen Sturm Niz, Capstone, 2006Picture Perfect Science		

Third Grade Suggested Scope and Sequence

NGSS Body of Knowledge: Physical Science
Unit of Study: Matter & Its Properties (4 weeks)

Prerequisite Learning: Kindergarten – SC.K.P.8.1, SC.K.P.9.1
First Grade – SC.1.P.8.1, SC.1.E.5.3
Second Grade – SC.2.P.8.1, SC.2.P.8.2, SC.2.P.8.3, SC.2.P.8.4, SC.2.P.8.6, SC.2.P.9.1

Topics	Learning Targets/Skills	Standard(s)	Vocabulary
Properties of Matter	*Compare materials and objects according to properties such as size, shape, color, texture, and hardness.* ***Students will:*** • **identify** physical properties of matter (observable and measurable) used to describe objects (e.g., size, shape, color, texture, hardness, length, weight, temperature). • **classify** objects according to similar properties. • **compare** the physical properties of matter (e.g., size, shape, color, texture, hardness). • **record** comparisons in their science notebook.	**SC.3.P.8.3** Embedded Nature of Science SC.3.N.1.3	**balance** **scale** **beaker** **displaced** **graduated cylinder** **hardness** **heat** **energy** **length, width, height** o centimeters (cm) o meters (m) o kilometers (km) **liquid** **mass (weight)** o grams (g) o kilograms (kg) **measure** **pan balance** **physical properties** **scale** **size** **solid** **spring scale** **temperature** o Celsius (˚C) o Fahrenheit (˚F) **texture** **thermometer** **triple beam balance** **volume** o milliliters (mL) o liters (L) **water displacement**
	Measure and compare the mass and volume of solids and liquids. ***Students will:*** • **investigate** mass and volume as measurable properties of matter. • **match** appropriate tools and units of measure associated with mass and volume. • **measure** the mass and volume of solids and liquids using appropriate tools. • **measure** the volume of solids (e.g., rock, shell, marble, pencil, dice) using the *water displacement method*. • **compare** the mass and volume of different solids and liquids as measured by the same group of students (e.g., the marble displaced more water than the penny – the rock has a greater volume than the marble). • **compare** measurements of solids and liquids made by different groups using the same tools and seek reasons to explain the differences across the groups. • **explain** that two objects of the same volume may have a different mass.	**SC.3.P.8.2** Embedded Nature of Science SC.3.N.1.2 SC.3.N.1.3	

	Measure and compare temperatures of various samples of solids and liquids. ***Students will:*** • **read** the temperature on a thermometer in both Celsius and Fahrenheit to measure heat energy. • **measure and compare** temperatures of various samples of solids and liquids using a thermometer (Fahrenheit and Celsius).	**SC.3.P.8.1** Embedded Nature of Science SC.3.N.1.3	
Changes in Matter	*Describe the changes water undergoes when it changes state through heating and cooling by using familiar scientific terms such as melting, freezing, boiling, evaporation, and condensation.* *Recognize that words in science can have different or more specific meanings than their use in everyday language.* ***Students will:*** • **review** the three states of matter (solid, liquid, gas). • **review** the properties for each state of matter (e.g. a gas fills its container, a liquid takes the shape of its container, and a solid keeps its shape). • **investigate** melting, freezing, boiling, evaporation, and condensation of water. • **infer** based on observations made during the water investigations (e.g., an increase or decrease in heat energy is needed to bring about a change of state). • **describe** how water changes its state through heating and cooling (e.g. condensation • occurs when water vapor loses heat so will then change from a gas to a liquid.)	**SC.3.P.9.1** **SC.3.N.3.1** Embedded Nature of Science SC.3.N.1.1 SC.3.N.1.3 SC.3.N.1.6 SC.3.N.1.7 SC.3.N.3.1	**boiling** **change** **condensation** **cooling** **energy** **evaporation** **freezing** **heating** **heat loss** **heat gain** **melting** **water**

Resource Alignment	Properties of Matter	Changes in Matter
Pearson Teacher's Edition	pg. 34cTE	pg. 58cTE
Pearson Student's Edition	pg. 42-47 Measuring Matter: pg. 48-55	pg. 58-64
Hand's on Student Activities and Labs	pg. 36-37, 41, 49, 56-57	pg. 59, 62-63, 74-75

Page Keeley		Lesson 9 - Melting - pg 73-78 Lesson 21 - Wet Jeans pg 165-172
Content Limits for Standards	Items will not address or assess particle behavior in each state of matter or between states of matter. Items will not address or assess the water cycle. Items may refer to common tools used to measure basic properties of solids, liquids, and gases but will not assess specific knowledge of the tools. Items will not assess the difference between weight and mass. Items will not assess unit of measure. Items will not require unit conversions to compare data. Items will not address or assess density as a property.	Items will not assess particle motion in changes of states of matter.
Daily & Key Questions	***What are some Physical Properties?*** ***How Are Mass & Volume Measured? How Is Temperature Measured?*** **What are some physical properties that can be measured?** physical properties that can be measured are length, width, height, mass, volume, and temperature How are rulers, balance scales, graduated cylinders, and thermometers used to measure the physical properties of matter? metric rulers and meter sticks measure length, balance scales with gram weights measure mass, graduated cylinders or metric measuring cups measure volume, and thermometers measure temperature When can the physical properties of one material be compared to another material? the physical properties of one material can be compared to another material only when they are measured in like units, such as comparing meters to meters, grams to grams, etc **What is a thermometer?** a thermometer is a tool used to measure temperature (how hot or cold a substance is) **How does a thermometer measure temperature?** a thermometer measures the gain or loss in heat by placing it in or on a substance and recording the change in the red fluid's position by numbered degrees up or down. The higher the number (integer), the more heat. (Temperature is a measure of the average (kinetic) energy of the moving particles in a substance. The faster the particles are moving, the more energy the substance has and the hotter it gets.) **What is mass and volume?** mass and volume are properties of matter. Mass is the amount of matter an object contains, and volume is	***What Are the States of Matter?*** ***How Can the State of Matter Change?*** **How does heating change matter?** solids eventually melt into liquids and liquids eventually vaporize into gases **How does cooling change matter?** gases usually change into liquids and liquids eventually change into solids. (Note: There are some exceptions. For example, dry ice (frozen carbon dioxide) changes from a solid to a gas (or sublimates) skipping the liquid stage when heated. Teach to the norm, not the exception.) **How do solids, liquids and gases differ?** solids have a measurable shape and volume. (They keep their shape to take up the same amount of space.) Liquids change shape (take the shape of their containers) and have a measurable volume. Gases take the shape of their containers, but do not have a definite volume. (They will escape from their container once the lid is removed.)

	the amount of space it takes up. Mass is measured in grams (g) and kilograms (kg), and volume is measured in cubic centimeters (cm3), cubic meters (m3), or milliliters (mL), Liters (L) and kiloliters (kL) **What is density?** density is a property of matter. It compares the mass (amount of matter) per volume (amount of space) in an object	
Teacher Hints	• Consider using a variety of matter (living or nonliving) for observation and measurement experiences. • Physical properties are observable and measurable. Observable properties of matter are described by using the five senses such as shape, color, texture, and hardness. The five senses may be enhanced by using a hand lens and/or a microscope. Measurable properties of matter are described using measurement tools. These tools measure volume, mass, length, and temperature. • Consider exposing students to a variety of tools to measure mass and volume. Measuring tools for mass include a spring scale, pan balance, triple beam balance, and balance scale. Measuring tools for volume include beaker, graduated cylinder, flask, and measuring cup. • This is the first experience the students will have with the term mass as it is used in the NGSSS curriculum. • Students do not need to understand the difference between mass and weight; the words may be used interchangeably at this grade. • The water displacement method is a technique used to measure the volume of an object by calculating how much water it displaces or pushes aside when placed into a sample of water. To determine the volume of an object, subtract the final water level from the starting water level. There is not necessarily a correlation between mass and volume. For example, two blocks of the same size and shape but different composition (a wood block and a metal block) may have different masses but the same volume. • To give students a frame of reference for water displacement, remind them of how the water level changes after they get into a bath tub or a small, kiddie pool. • The water displacement method is used to measure the volume of both regular and irregular-shaped objects (objects that cannot be measured easily using a ruler or measuring tape, such as rocks and marbles). Students do not need to know how to calculate the volume of regular-shaped objects using the volume formula (base x width x height) in science.	• Define and explain vocabulary associated with matter changes using Thinking Maps® and other graphic organizers in science notebooks. melting – changing from solid (ice) to a liquid (water) due to a heat gain evaporating – changing from a liquid (water) to gas (vapor) due to a heat gain condensing – changing from a gas (vapor) to a liquid (water) due to a heat loss freezing – changing from a liquid (water) to a solid (ice) due to a heat loss • Using the terminology losing heat (a heat loss) or gaining heat (a heat gain) is a precursor to • SC.4.P.11.1 - Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature. • Please note: Changes in states of matter are limited to changes in states of water only. • Connections to the water cycle are naturally made during this unit, however the process of the water cycle is NOT taught at this grade level. • Exploring the changes that occur in the states of matter may be done through the following investigations: • Place water in the bottom of a plastic bag, seal, and then place the bag in a window for an hour. • Place water in a cup and observe and measure how water evaporates during the day. • Make pictures on the sidewalk with water and observe what happens (puddle pictures). • Place a wet paper towel in the sun and record observations over a period of time.

Supplemental Literature	Mr. Archimedes' Bath by Pamela Allen Drip! Drop!: How Water Gets to Your Tap by Barbara Seuling, Holiday House, 2000 Temperature by Rebecca Olien, Capstone, 2005 What's the Matter in Mr. Whisker's Room? by Michael Elsohn Ross, Candlewick, 2007 Matter by Christine Webster, Capstone, 2005 A Book About Bubbles by Kimberly Brubaker Bradley, HarperCollins, 2001	
Thinking Maps ®	Bubble Map (describing matter) Double Bubble (compare the properties of matter; temperatures) Tree Map (title of solid and give examples)	Flow Map (stages of matter) Multi-flow Map (stages of matter) Brace Map (different stages of water)
CPALMS	Mass and Volume, They Matter! http://www.cpalms.org/Public/PreviewResourceLesson/Preview/35633 States of Water Part 1 http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46143 Exploring the States of Water http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46419	Changing the State of Water From Liquid to Vapor http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46308 States of Water Part 2 http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46551 Understanding Mass and Matter http://www.cpalms.org/Public/PreviewResourceUrl/Preview/2450
Web Resources	Happy Scientist: *Matter* Scholastic Study Jams: *Properties of Matter* Scholastic Study Jams: *Solids, Liquids, and Gases* Brain Pop Jr.: *Solids, Liquids, and Gases* *States of Matter Video* *Matter Rap*	Brain Pop Jr.: *Changing States of Matter* *Changes in Matter Video* *Matter Video*

Third Grade Suggested Scope and Sequence

NGSS Body of Knowledge: Physical Science
Unit of Study: Energy (3 weeks)

Prerequisite Learning: Kindergarten – SC.K.P.10.1, SC.K.P.12.1, SC.K.P.13.1
First Grade – SC.1.P.12.1, SC.1.P.13.1
Second Grade – SC.2.P.10.1, SC.2.P.13.1

Topics	Learning Targets/Skills	Standard(s)	Vocabulary

Forms of Energy	*Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical.*
	
	Students will:
	• **identify and record** some basic forms of energy in a science notebook (light, heat, sound, electrical and mechanical).
	NOTE: Extensive instruction on light and heat occurs during Weeks 13-14.
	• **identify and record** examples of energy sources for each form of energy listed below:
	  ◦ light energy (e.g., sun, light bulb, stars, kaleidoscope).
	  ◦ heat energy (e.g., sun, stove, candle, own body, campfire).
	  ◦ sound energy (e.g., thunder, voice, radio, musical instruments, tuning fork).
	  ◦ electrical energy (e.g., battery, computer, clock, static).
	  ◦ mechanical energy (e.g., ball, windmill, rollercoaster).
		SC.3.P.10.1
		
		Embedded Nature of Science
		SC.3.N.1.3
		SC.3.N.1.7
			change
			electrical energy
			energy sources
			heat
			light
			mechanical
			motion
			sound

Motion	*Recognize that energy has the ability to cause motion or create change.* ***Students will:*** • **investigate and describe** ways that energy can cause motion (e.g., hairdryer, toaster, car, windmill, fan blades, bulldozer, jack-in-the-box, sailboat, hands on a watch). • **investigate and describe** how energy has the ability to create a change (e.g., melting chocolate, evaporating water, drying hair, cooking food, using a microphone, playing musical instruments). • **identify** the form of energy that causes motion or creates change in an object. • **infer** based on observations made during motion investigations (e.g., giving the car a push will move it along the track, raising the ramp will increase the distance the car will travel).	**SC.3.P.10.2** Embedded Nature of Science SC.3.N.1.1 SC.3.N.1.3 SC.3.N.1.6 SC.3.N.1.7 SC.3.N.3.1	

Heat	*Investigate, observe, and explain that heat is produced when one object rubs against another, such as rubbing one's hands together.* ***Students will:*** • **investigate and explain** how rubbing two objects together produces heat (friction). • **identify** everyday examples of objects rubbing against one another to produce heat (e.g., brakes applying force on a bike to stop, sliding down a rope, rubbing an eraser on a piece of paper).	**SC.3.P.11.2** Embedded Nature of Science SC.3.N.1.1 SC.3.N.1.3 SC.3.N.3.1	**friction** **heat**

Resource Alignment	Forms of Energy	Motion	Heat
Pearson Teacher's Edition	pg. 82, 94-97cTE	pg. 87, 91-93cTE	
Pearson Student's Edition	pg. 82, 84-87, 90, 94-97	pg., 87, 92-99	
Hand's on Student Activities & Labs	pg. 80, 86, 98-99	pg. 83, 91, 100-101	
Content Limits for Standards	Items assessing basic forms of energy are limited to light, heat (thermal), sound, electrical, chemical, and mechanical energy. Items will not assess the transformation of energy from one form to another. Items assessing light reflection, refraction, or absorption should use the term reflect, bend, or absorb to describe light's behavior.	Items will not assess sound and chemical energy.	Items assessing basic forms of energy are limited to light, heat (thermal), sound, electrical, chemical, and mechanical energy. Items will not assess the transformation of energy from one form to another. Items assessing light reflection, refraction, or absorption should use the term reflect, bend, or absorb to describe light's behavior.
Daily & Key Questions	**What is light?** a form of energy that travels in waves and can move through empty space where there is no air **What is sound?** sound is a form of energy produced by vibrating objects. The vibration pushes particles of matter next to it thereby compressing the matter and sending a wave of energy through the matter **What is heat?** heat is the energy of moving	**What is motion?** motion is the change of position of an object **What is force?** a push or pull **What causes motion?** Motion is caused when unbalanced forces are applied to an object. Forces act in pairs opposite in direction to each other. If the pair of forces are balanced (equal in strength), the object is 'at rest' (not moving). However, when one force becomes stronger than	**Heat Sources?** **Where Can Heat Come From?** **What is friction?** friction is a force between two surfaces rubbing against each other. Friction works against motion

	particles in a substance **What is electrical energy?** a form of energy that is produced when electrons move from one place to another **What is mechanical energy?** the energy an object has because of its motion or position	the other (unbalancing the pair of forces), the object begins to move in the direction the stronger force is applied. The more force applied, the faster the object will move	
Teacher Hints	Mechanical energy is the energy of position and motion. Although the Science Fusion textbook resource provides instructional support of *potential and kinetic energy*, students do not need to be able to distinguish between *potential* and *kinetic energy*. For assessment purposes, scenarios referring to mechanical energy should not use the term *kinetic energy* or *potential energy.* Light energy is carried by light waves. Sound energy is carried by sound waves. Energy transformations are not formally assessed in grade 3 but are assessed in grade 5 in terms of electrical energy. Electrical energy can transform (change form) into light, heat, and/or sound energy. Light energy may be produced from another form of energy (e.g., electrical to light, chemical to light). In grade 3, students are asked to rub their hands together to transform mechanical energy into heat energy.	Energy is needed for a force (push or pull). If there is enough force, an object may move. For example, in order for a ball to travel in the air, a person's hand has to have enough energy to push the ball forward to set it into motion. Have students do an energy walk around the school and identify situations in which energy is causing motion. Play an "I Spy Energy" game. Students give clues of items around the classroom in which energy is being used to cause motion and/or create change. Engage students in a discussion about what would happen if energy was not available.	• Students need to be comfortable reading a thermometer with temperatures readings in both Celsius and Fahrenheit. Students should be exposed to measuring temperature using a dual thermometer (has both Celsius and Fahrenheit readings). • Practicing with horizontal and vertical number lines will assist students in reading a thermometer. • Heat is energy that moves from warmer to cooler objects. Using the terminology losing heat (a heat loss) or gaining heat (a heat gain) is a precursor to 4.P.11.1 - *Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature.* • To better understand how a thermometer works, consider making a classroom thermometer (Make a Thermometer www.weatherkids.com). • Some objects give off light but no heat (moonlight, bioluminescence, glow-in-the-dark stickers) while other

			objects give off heat but no light (heating pad, hand warmers, chemical reactions).
Supplemental Literature	Energy by Christine Webster, Capstone, 2005 Energy by Don Herweck, Compass Point, 2009 Light: Look Out! by Wendy Sadler, Raintree, 2006		
Thinking Maps ®	Bubble Maps (different types of energy) Tree Map (specific types of energy and their details)	Bubble Maps (examples of motion/ things on a playground that move) Flow Map (show how object can produce motion)	Circle Map (resources of heat)
Foldables	Layered/Step book – Types of Energy (heat, light, sound, electrical, mechanical)		
CPALMS		*The Cause and Effect of Motion* *http://www.cpalms.org/Public/PreviewResourceLesson/Preview/32273*	
Web Resources	Brain Pop Jr: *Energy Sources* *What is Energy?* *Types of Energy* *Force, Work, and Energy Relationship*		

Third Grade Suggested Scope and Sequence

NGSS Body of Knowledge: Physical Science
Unit of Study: Heat & Light (3 weeks)

Prerequisite Learning: Kindergarten – SC.K.P.10.1
First Grade – none
Second Grade – SC.2.P.10.1

Topics	Learning Targets/Skills	Standard(s)	Vocabulary
Light	*Demonstrate that light travels in a straight line until it strikes an object or travels from one medium to another.* ***Students will:*** • **identify** that light can come from different sources (e.g., sun, electric lamp, candle). • **investigate** that light travels in a straight line until it strikes an object or surface. • **investigate and explain** what happens to the path of light as it travels from the source of light to objects that are transparent (e.g., glass, cellophane), translucent (e.g., wax paper, light covers), and opaque (e.g., clay pot, chalk board, science book, hand). • **demonstrate** that when light does not pass through an object, it forms a shadow.	**SC.3.P.10.3** Embedded Nature of Science SC.3.N.1.1 SC.3.N.1.3 SC.3.N.1.7	**absorb** **bend (refract)** **bounce (reflect)** **color** **light** **opaque** **shadow** **translucent** **transparent**
	Demonstrate that light can be reflected, refracted, and absorbed. **Students will:** • **demonstrate** what happens when light bounces off of a smooth or rough surface (reflection). • **demonstrate** what happens when light bends as it passes from one medium through another (bending/refraction). • **identify** the colors of the light spectrum (red, orange, yellow, green, blue, indigo, violet). • **explain** that the color of an object is the result of light being reflected and absorbed (e.g., a • banana is yellow because it absorbs all colors of the light spectrum except yellow which is reflected back to a person's eyes).	**SC.3.P.10.4** Embedded Nature of Science SC.3.N.1.1 SC.3.N.1.3 SC.3.N.1.7	

Heat	*Investigate, observe, and explain that things give off light often also give off heat.* ***Students will:*** • **identify** objects that give off both heat and light. • **investigate** ways in which light gives off heat. • **explain** that when matter emits heat, it is losing heat. • **explain** the relationship between light and heat (i.e., objects that emit light also give off heat but objects that give off heat may not necessarily emit light).	**SC.3.P.11.1** Embedded Nature of Science SC.3.N.1.1	**heat**

Resource Alignment	**Light**	**Heat**
Pearson Teacher's Edition	pg.102cTE	pg. 106cTE
Pearson Student's Edition	pg. 104-105	pg. 106-108
Hands-on Student Activities and Labs	pg. 103, 116-117	pg. 107
Content Limits for Standards	• Items assessing basic forms of energy are limited to light, heat (thermal), sound, electrical, chemical, and mechanical energy. • Items will not assess the transformation of energy from one form to another. • Items assessing light reflection, refraction, or absorption should use the term reflect, bend, or absorb to describe light's behavior.	
Daily & Key Questions	***How Does Light Move?*** ***What Surface Reflects Light Best?*** **Three cards with a hole punched in the center are aligned so each hole is in line with the next. Predict what will happen to light rays when a light bulb is turned on**. The light will pass through the holes in the cards spreading out as it comes to the next card. Because the holes are aligned, some light will pass through each hole and every card because light travels in a straight line. If the cards were not aligned the light would be absorbed by the next card and go no further. **Describe reflected light and give an example.** Reflection is the bouncing back of light rays from a surface. Like when a light bounces off a mirror and back at you. **Describe refracted light and give an example.** Refraction is the bending of light rays as they move from one material to another material. Like when a pencil in a glass of water appears broken where the pencil enters the water. **Describe absorbed light and give an example.** Light is absorbed when it gets trapped in a material. Like when a flashlight	**Why do objects that give off light also give off heat?** both light and heat are part of the electromagnetic spectrum of energy. Because visible light and infrared light (heat) are right next to each other on that spectrum they usually accompany each other

	shines on a solid wall but cannot pass through the wall or around the wall to the other side.	

Teacher Hints	• No matter the source (sun, light bulb, lit candle), light travels in a straight line until it strikes an object or surface. Light may be bent (refracted), reflected and/or absorbed once it strikes an object or surface.
	• Items assessing light reflection, refraction, or absorption should use the terms *reflect, bend,* or *absorb* to describe light's behavior.
	• One example of an investigation to show the relationship between light and shadows involves students going outside and tracing shadows at different times of day and recording in a science notebook what is seen.
	• Objects get their color from selective absorption. Below are some examples.
	    • A green frog gets its color by absorbing all colors except green.
	    • A piece of white chalk gets its color by reflecting all colors and absorbing none.
	    • A black cat gets it color by absorbing all colors and reflecting none.
	• Being able to see the reflected object on the surface that the light strikes is evidence of reflection (e.g., an image on a mirror or on body of water). This can be investigated by shining a flashlight onto a piece of aluminum foil to see the reflected light from the flashlight.
	• Absorption of light energy can be investigated by measuring the temperature of different colors of water, jello, paper, etc.
	• Activities for bending (refraction) include placing a spoon or pencil in water, using a magnifying lens, and prisms.
	• When you see an object through a glass of water, it does appear bent. This is evidence that the light bends as it travels through the water. The light is also being reflected! We would not be able to see the object at all if it was not for reflection. Another good example of bending light is to think about a boat anchor in the water. If you look over the side of the boat, the anchor appears much closer and in a different position than it actually is. This is also illustrated by placing a penny in a cup of water. Try it!
	• Investigations of dark colors vs. light colors provide students with an opportunity to understand the relationship between absorption of light and temperature.
		• Students need to be comfortable reading a thermometer with temperatures readings in both Celsius and Fahrenheit. Students should be exposed to measuring temperature using a dual thermometer (has both Celsius and Fahrenheit readings).
		• Practicing with horizontal and vertical number lines will assist students in reading a thermometer.
		• Heat is energy that moves from warmer to cooler objects. Using the terminology losing heat (a heat loss) or gaining heat (a heat gain) is a precursor to 4.P.11.1 - *Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature.*
		• To better understand how a thermometer works, consider making a classroom thermometer (Make a Thermometer www.weatherkids.com).
		• Some objects give off light but no heat (moonlight, bioluminescence, glow-in-the-dark stickers) while other objects give off heat but no light (heating pad, hand warmers, chemical reactions).

Books	Magic School Bus Chapter Book: *Color Day Relay* (Scholastic Publishing) Light: Look Out! by Wendy Sadler, Raintree, 2006	

Thinking Maps ®	Circle Map (list various types of light) ; Bubble Map (opaque, transparent and translucent); Multi -flow Map (cause and effect of different objects with light)	Circle Map (resources of heat)
Foldables	Two-tab book – reflection and bending (refraction) Trifold Flip book/Pyramid book – opaque, translucent and transparent Layered book/Step book – spectrum including red, orange, yellow, green, blue, indigo and violet	Two-tab book – temperature (compare Fahrenheit and Celsius) Two-tab book – conductors and insulators
CPALMS	*How Light Moves* *http://www.cpalms.org/Public/PreviewResourceUrl/Preview/20111*	*When Things Start Heating Up* *Friction* *http://www.cpalms.org/Public/PreviewResourceUrl/Preview/4973*
Web Resources	Happy Scientist: *Looking for Rainbows* Happy Scientist: *White Foam* Happy Scientist: *FCAT Question 1* Happy Scientist: *FCAT Question 2* Happy Scientist: *FCAT Question 3* Happy Scientist: *FCAT Question 4* *Scholastic Study Jams: Light Absorption, Reflection and Refraction* Brain Pop Jr.: *Light* Try Science Experiment - *Iron for Breakfast* *What is Energy?* *Plant Websites and Games* *Vision and Optics Lesson* *The Visible Spectrum Video*	Happy Scientist: *How Heat Moves* Scholastic Study Jams: *Heat* Brain Pop Jr.: *Heat*

Third Grade Suggested Scope and Sequence			
NGSS Body of Knowledge: Earth/Space Science Unit of Study: The Universe (5 weeks)			
Prerequisite Learning: Kindergarten – SC.K.E.5.1, SC.K.E.5.5, SC.K.E.5.6, SC.K.P.13.1 First Grade – SC.1.E.5.1, SC.1.E.5.2, SC.1.E.5.4, SC.1.P.13.1 Second Grade – SC.2.P.10.1, SC.2.P.13.1, SC.2.P.13.2, SC.2.P.13.3, SC.2.P.13.4			
Topics	Learning Targets/Skills	Standard(s)	Vocabulary
Stars & Sun	*****NOTE: In preparation for the plant unit during Weeks 22-28, begin setting up for hands-on investigations by growing seeds and planting/acquiring different varieties of mature plants.** *Recognize that the sun appears large and bright because it is the closest star to the Earth.* *Identify the sun as a star that emits energy; some of it in the form of light.* ***Students will:*** • **identify** the sun as a star in our solar system that emits its own energy (light and heat). • **compare** the size of the sun to that of the other stars. • **explain** that the sun is a medium-size star, but it appears to be the largest, brightest star in the sky because it is closest to Earth. *Explain that stars can be different; some are smaller, some are larger, and some appear brighter than others; all except the Sun are so far away that they look like points of light.* ***Students will:*** • **explain** how stars can be different (size, brightness, and distance from Earth). • **compare** the appearance of the sun's size, brightness, and its distance from Earth compared to all the other stars. • **explain** how distance makes stars appear as though they are points of light. • **explain** that stars are fixed points of light in the sky. • **explain** that stars are in the day sky but cannot be seen because of the sun's glare. *Demonstrate that radiant energy from the sun can heat objects and when the sun is not present, heat may be lost.* ***Students will:***	**SC.3.E.5.3** **SC.3.E.5.2** **SC.3.E.5.1** Embedded Nature of Science SC.3.N.1.1 **SC.3.E.6.1**	**brightness** **color** **distance** **emit** **heat gain** **heat loss** **light** **magnify** **radiant energy** **size** **star** **sun** **telescope** **temperature**

	• **predict** how the sun's presence, visible or not visible, will impact objects (e.g., size, shape, state, color, temperature, absorbing moisture). • **investigate** the effects of the sun's heat on different objects (e.g., chocolate, sand, soil, crayons, water, rocks). • **record** observations of investigations involving heat in a science notebook (e.g., temperature of soil in the sun vs. temperature of soil in the shade or when the sun is behind the clouds). • **compare** observations with those of different student groups, discussing any differences. • **explain** that heat is lost when the sun is not visible. • **explain** the changes that may occur when the sun is visible and not visible. *Investigate that the number of stars that can be seen through telescopes is dramatically greater than those seen by the unaided eye.* ***Students will:*** • **describe** the purpose of a telescope as a tool to magnify objects that are far away (e.g., stars, moon, comets). • **compare** images of the night sky taken with and without a telescope to demonstrate how this tool dramatically increases the number of stars that can be seen.	Embedded Nature of Science SC.3.N.1.1 SC.3.N.1.2 SC.3.N.1.3 SC.3.N.1.5 **SC.3.E.5.5**	
Gravity	*Explore the Law of Gravity by demonstrating that gravity is a force that can be overcome.* ***Students will:*** • **explain** the effect gravity has on objects. • **investigate** ways to overcome the force of gravity (e.g., filling a balloon with helium, catching a ball before it hits the ground, floating an object in a liquid, growing plants, jumping). • **explain** how gravity can be overcome.	**SC.3.E.5.4** Embedded Nature of Science SC.3.N.1.1	**force** **gravity** **overcome gravity**

Resource Alignment	**Stars**	**Gravity**
Pearson Teacher's Edition	pg.1cTE	pg. 22-23cTE
Pearson Student's Edition	pg. 2-3, 7, 8, 9, 13, 14,24-25, 26, 28-29	pg. 22-23

Hands-on Student Activities and Labs	pg.7, 16-17, 19, 24-25, 32-33	pg. 23
Content Limits for Standard	Items will only assess a conceptual understanding of a galaxy. Items will not assess the name of our galaxy in isolation. Items will not assess objects orbiting stars. Items that assess stars are limited to brightness, size, or appearance in relation to distance, and that stars emit energy. Items that address energy emitted by a star are limited to visible light. Items will not assess the effects of the Sun's energy on Earth. Items will not assess numeric values for distance or number of stars. Items may assess that stars are made of gases but not the specific chemical composition of stars.	Items assessing familiar forces are limited to pushes, pulls, friction, gravity, and magnetic force.
Daily & Key Questions	***How Many Stars Do You See? How Does the Sun Heat Earth?*** **How are the other stars different from our sun?** because our sun is the closest star to Earth, it looks bigger than the other stars. The other stars look tiny because they are much farther away. Our sun is a medium-sized, yellow star. Other stars are different colors. Blue and white stars are the hottest and red stars are the coolest. Other stars are different sizes, some smaller and some much larger than our sun. Some stars are very bright. A star may appear bright because it is closer to Earth or because it is bigger and hotter than other stars **What is a telescope?** a telescope is a tool for observing distant objects. Light telescopes use lenses and mirrors to capture light from distant objects in space. Light telescopes collect much lighter than you can see with just your eyes. Objects which are too dim for you to see with your eyes can become visible with a light telescope **What is the sun?** the sun is a star, a very hot ball of glowing hydrogen gas that gives off light. It looks different than other stars because it is so close to the Earth - only 150,000,000 km away or 93,000,000 miles. The next nearest star, Proxima Centauri, is 40,000,000,000 km away **What types of energy does the Earth get from the sun?** the sun provides the Earth with both light (radiant energy) and heat (thermal energy). Rays of light waves travel through empty space to all the planets and beyond. When sunlight enters the Earth's atmosphere, it increases the motion of all the particles of matter, solids, liquids, and gases it meets making them warmer	***What Is Gravity?*** **What is gravity?** gravity is the force of attraction (pulling force) between objects that have mass. The strength of gravity between objects depends on two things: the mass of the objects and the distance between them **What is weight?** weight is the measure of the pulling force of gravity on an object. Weight can vary depending on mass (more massive objects have more pulling force) or distance (the farther an object is from the center of gravity the less pulling force)

	What is the largest object in the solar system? the sun, a star in the center of our solar system, makes up 99.8% of the mass of our solar system **What holds the solar system together?** the sun is both the largest object in our solar system and the most massive, according to Newton's Law of Universal Gravity, the greater the mass the stronger the gravity between objects. Since the other objects in the solar system have a much smaller mass than the sun, the sun's gravity holds the planets, moons, asteroids, and comets in orbit What is radiation? radiation is the transfer of light and heat waves (electromagnetic energy). Unlike conduction and convection, which involve the contact, collision or movement of particles, radiation can travel through empty space. The sun heats the Earth through the process of radiation. If the sun's rays are blocked or absorbed, the transfer of heat is reduced, and stored heat can be lost	
Teacher Hints	• A star is an object in space that produces its own heat and light and is composed of gases and dust particles. • The sun is a medium-sized star. A common misconception is that the sun is the largest star. It appears to be the largest because of its proximity to Earth. • A galaxy is a group of millions of stars. The sun is the closest star to Earth in the Milky Way galaxy. • The term 'star patterns' refers to constellations. Students may see the terms *patterns of stars in the sky* or *star patterns* on FCAT 2.0. Students will not have to know or identify names of star patterns. Future grade levels will focus on star positions in the night sky. • The color and temperature of stars are related. The coolest are red, the hottest are blue, and medium-hot are yellow. Our sun is a medium-hot, yellow star. • Students must understand that although the sun appears to move across our sky, it is the Earth's rotation causing the pattern of day and night. The sun being present or not present may lead to student misconceptions that the sun is moving instead of the Earth moving. • The sun generates its own radiant heat and we feel this heat from the sun here on Earth. The Earth's surface and other matter gains and loses heat that has come from the sun. Temperature is the measurement we use to record heat energy, and the loss or gain of heat at any given time. When the sun is not present, objects may lose heat. When	• Gravity is a force that pulls objects towards Earth's surface. All objects will fall to the Earth if they are not held up by something. A leaf will fall if it is not connected to a branch. A paper will fall if it is not on a table. Gravity is an example of a non-contact force. An object will move downward without a force 'touching' it. • Overcoming gravity means to push up against the force of gravity. We used to refer to this as 'defying gravity'. One way humans overcome gravity is by jumping up, climbing a ladder, or by taking an airplane or helicopter ride. • When clarifying the Law of Gravity, use examples of how to overcome gravity (e.g., jumping, magnets, airplanes, Mentos and Coke Lab- http://www.stevespanglerscience.com/experiment/original-mentos-diet-coke-geyser, Alka-Seltzer and film canister lab- http://www.stevespanglerscience.com/experiment/film- canister-rocket). • Consider demonstrating the ability to overcome gravity using contact and non-contact forces. • Present students with a listing of events that contain both examples of gravity and overcoming gravity. Have them sort this list, and then give their rationale as to why they sorted these events into one of the two groups. • Simple machines instruction is no longer curriculum for elementary. However, simple machines may be used when giving examples of overcoming gravity. For example, a pulley overcomes gravity by lifting things up.

	the sun is present, objects gain heat through absorption. Using the terminology losing heat (a heat loss) or gaining heat (a heat gain) is a precursor to SC.4.P.11.1 - *Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature.* • In the first units, students learned the purpose of using models when investigating. Our current knowledge of space has been partly due to the construction and use of models. Students and other scientists are not able to physically experience space, but they can continue their learning by using models of the different space bodies such as the Earth, sun, moon, and stars. As we learn more about space, models are constantly revised to fit new thinking and learning.	
Supplemental Literature	*Galaxies, Galaxies* by Gail Gibbons *Sun Up, Sun Down* by Gail Gibbons *Stargazers* by Gail Gibbons *The Stars* by Patricia Whitehouse, Heinemann, 2004 *My Light* by Molly Bang, Blue Sky, 2004 *Night Wonders* by Jane Ann Peddicord, Charlesbridge, 2005	
Thinking Maps ®	Bubble Map (characteristics of stars) Double Bubble (comparing stars) Tree Map (three type of stars)	Circle Map (items that defy gravity)
Foldables	Two-fold book – star colors vs. star temperatures	Tab book – gravity and weight on other planets Tab book – examples of defying gravity
Web Resources	Brain Pop Jr.: *The Sun* Animation of Earth's Size Compared to Sun Fast Facts About the Sun	Scholastic Study Jams: *Gravity & Inertia* Brain Pop Jr.: *Gravity* Bill Nye: *Gravity*

Third Grade Suggested Scope and Sequence

NGSS Body of Knowledge: Life Science
Unit of Study: Plants (5 weeks)

Prerequisite Learning: Kindergarten – SC.K.L.14.3
First Grade – SC.1.L.14.1, SC.1.L.14.2, SC.1.L.14.3
Second Grade – none

Topics	Learning Targets/Skills	Standard(s)	Vocabulary
Plant Structures and Functions	*Recognize that plants use energy from the sun, air, and water to make their own food.* *Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction* ***Students will:*** • **identify** what plants need to grow (light, air, water). • **explain** the process of photosynthesis in plants (the use of carbon dioxide in the air, water, and energy from the sun to make their own food). • **record** observations of real plant structures in a science notebook. • **identify and describe** plant structures and their major functions. ◦ leaves/needles - food production ◦ roots and stems - support ◦ roots - water and nutrient absorption and transport ◦ stems - water and nutrient transport ◦ flowers/cones - reproduction ◦ seeds/spores - survival and reproduction	**SC.3.L.17.2** **SC.3.L.14.1**	**carbon dioxide** **photosynthesis** **cones** **energy** **flowers** **function** **leaves** **needles** **roots** **seeds** **spores** **stems** **structure**
Plant Responses	*Investigate and describe how plants respond to stimuli (heat, light, gravity), such as the way plant stems grow toward light and their roots grow downward in response to gravity.* ***Students will:*** • **review** heat, light, and gravity. • **investigate and describe** how plants respond to heat (e.g., dormancy, germination, release of pine cone seeds after a forest fire, wilting, loss of fruit, dying). • **investigate and describe** how plants respond to light (e.g., overall growth, seed/fruit production, stems grow upward and bend towards light). • **investigate and describe** how plants respond to gravity (e.g., roots grow downward**,** stem grows upward).	**SC.3.L.14.2** Embedded Nature of Science SC.3.N.1.1 SC.3.N.1.2 SC.3.N.1.3	**conclusion** **control group** **dormancy** **germination** **hypothesis** **investigation** **plant response** ○ heat ○ light ○ gravity **variable** **wilting**

	• **experiment** ways plants respond to light, heat, and gravity (form a hypothesis, record observations, compare observations, draw conclusions).		

Resource Alignment	Plant Structures and Functions	Plant Responses
Pearson Teacher's Edition	pg. 118cTE	pg. 124cTE
Pearson Student's Edition	pg. 126-129, 132-139	pg. 134-137, 144-149
Hand's-on student Activities & Labs	pg. 125, 133, 140-141, 145	pg. 122, 158-159
Content Limits for Standards	• Items assessing the flow of energy from the Sun through a food chain are limited to the direction of energy flow. • Items will not address or assess the amounts of energy flowing through the food chain or the efficiency of the energy transfers. • Items will not address or assess cellular respiration or any other cellular process. • Items will not address or assess decomposers. • Items will not address or assess food webs, trophic levels, or energy pyramids. • Items will not assess more than five components (links) in a food chain.	• Items assessing the structures and functions of major parts of plants are limited to stem, leaf/needle, root, flower, seed, and fruit. • Items assessing sexual reproduction in flowering plants are limited to stamen, pistil, ovary, petal, sperm, and egg. • Items will not assess cellular processes. • Items referring to a plant's response to stimuli are limited to a conceptual understanding of a plant's response to heat, light, or gravity. • Items will not use the term phototropism, geotropism, hydrotropism, or thigmotropism.
Daily & Key Questions	***What Are Some Plant Structures?*** **What four things do all plants need to live?** all plants need fresh water, light, carbon dioxide, minerals and nutrients **What structures do plants have to keep them alive?** plants have roots to anchor them in the soil and absorb water and minerals. They also have stems that connect to the roots supporting the plant and transporting water to their leaves. Plants also have leaves that collect carbon dioxide and water, and chemically change them into sugar (glucose) which the plant uses for food. At the same time, the plant gives off oxygen into the air. A plant's roots, stems, and leaves work together to keep the plant alive **What structures do plants need to reproduce?** to survive, a	***How Do Plants Respond to Light?*** ***How Do Plants Respond to Their Environment?*** **What is a stimulus?** a stimulus is anything that causes a response in an organism **What is a tropism?** a plant's growth in response to stimuli is called a tropism. Plants can't move like animals can, but they will still respond to stimuli, or changes in the environment. Gravitropism is when plant's roots grow downward in response to gravity. Phototropism is when plant's leaves turn to one side of the stem responding to sunlight. The response of plants to touch is called thigmotropism

	plant must produce seeds. Seeds are the structures that produce more plants. There are many kinds of seeds **How are green plants different from all other living organisms on Earth?** plants can make the food they need to survive in a process called photosynthesis **What is photosynthesis?** photo (light) - synthesis (put together) is a chemical process in which “green plants” recombine water (H20) and carbon dioxide (C02) into sugar (C6H1206) and oxygen (O2). Photosynthesis only takes place in plants with a “green” pigment molecule called chlorophyll. Chlorophyll helps the plant absorb the sunlight energy needed for photosynthesis to take place. Green plants are essential in the chemical process of photosynthesis. Without green plants most life on Earth would not exist **Why is photosynthesis important?** photosynthesis is a very important chemical process that only green plants can perform. Plants are the most important food energy source of consumers. If a consumer doesn't eat plants, then they eat other consumers that eat plants. Without plants, most life on Earth would not exist	
Teacher Hints	• Only plants make their own food for energy through photosynthesis. Animals eat plants or other animals for their energy. • The three ingredients for photosynthesis are light, air, and water. Plants need light, air, water, and nutrients from the soil to live and grow. Discuss how we provide these three ingredients in an inside environment. • Explore the same basic structures of different kinds of plants (roots, stems, leaves, and flowers). For example, a bean plant stem has different characteristics than the stem (trunk) of an oak tree. Plants include trees, shrubs, ferns, grass, rosebushes, marigolds, etc.	• To investigate a plant’s response to heat, students might consider germinating seeds at various temperatures (e.g., freezer, refrigerator, inside classroom, outside classroom). Remember: There is heat energy in a refrigerator and freezer. Plants require varying degrees of heat for germination. Tulip bulbs placed in a refrigerator will germinate while bean seeds will not. • To investigate a plant’s response to light, students might consider making observations of plants that are positioned in such a way that they have to move to gain access to light. You may want to build a box maze with a hole in the top to investigate a plant’s ability to move toward light (a plant that vines work best). • To investigate a plant’s response to gravity, students will best be able to observe this by germinating seeds (e.g., lima beans) by purposefully placing the seeds in different positions. Please note: Seeds must be planted in a container that allows students to observe roots daily (e.g., moist paper towel in a plastic bag, moist paper towel, and a clear plastic cup).

	• Consider having a 'Nature Table' in your classroom where students can display and observe different kinds of plant stems, leaves, and reproductive structures. What comparisons can be made?	• One possible way to conduct all these investigations is to divide the class into groups. Assign each group one of the stimuli to investigate. Try to organize the investigation so that there are multiple groups for each stimulus.
Books	From Seed to Plant by Gail Gibbons The Vegetables We Eat by Gail Gibbons Plants that Never Bloom by Ruth Heller Tell Me, Tree by Gail Gibbons The Magic School Bus Gets Planted: A Book about Photosynthesis by Lenore Notkin Dandelions: Stars in the Grass by Mia Posada, Carolrhoda, 2000 Green Plants: From Roots to Leaves by Louise and Richard Spilsbury, Heinemann, 2004 Pumpkin Circle: The Story of a Garden by George Levenson, Tricycle, 2004	
Thinking Maps ®	Brace Map (parts of a plant); Tree Map (classify different types of plants); Double Bubble (compare seed/cones or spores) Flow Map (steps of photosynthesis)	Tree Map (classifying how they reproduce); Double Bubble (compare different plant groups); Flow Map (growth of plant from seed to flower)
CPALMS	Classifying Plants: http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46417	Plants Responding to Different Factors http://www.cpalms.org/Public/PreviewResourceUpload/Preview/57444 Classifying Plants: http://www.cpalms.org/Public/PreviewResourceLesson/Preview/46417
Web Resources	Brain Pop Jr.: Parts of a Plant Brain Pop Jr.: Plant Life Cycle A Walk in the Forest Photosynthesis - Plants Make Food Video Photosynthesis - Learning is Fun	Investigate and Describe How Roots Respond to Gravity Experiment/Activity

Third Grade Suggested Scope and Sequence			
NGSS Body of Knowledge: Life Science Unit of Study: Living Things (5 weeks)			
Prerequisite Learning: Kindergarten – SC.K.L.14.3 First Grade – SC.1.L.14.3; SC.1.L.16.1, SC.1.L.17.1 Second Grade – SC.2.L.14.1; SC.2.L.17.1, SC.2.L.17.2			
Topics	Learning Targets/Skills	Standard(s)	Vocabulary

Plant Classification	*Classify flowering and nonflowering plants into major groups such as those that produce seeds, or those like ferns and mosses that produce spores, according to their physical characteristics.*
	Students will:
	• **identify** flowering plants (e.g., marigolds, cacti, apple tree, oak tree).
	• **identify** non-flowering plants that produce seeds (e.g., cypress tree, pine tree, sago palm, juniper tree).
	• **identify** non-flowering plants that produce spores (e.g., fern, moss, horsetails, liverworts).
	• **classify** plants into major groups based on their physical structures for reproduction.
	  ○ flowering (seed) vs. non-flowering (seeds or spores)
	  ○ seed production vs. spore production
	• **compare** the structures of different flowering plants (Note: Flowers of flowering plants may not be visible such as grass and cactus).
	• **compare** the structures of different nonflowering plants.
	• **compare** flowering and nonflowering plants.
	• **explain** the importance of communication among scientists who study plants.
		SC.3.L.15.2
		
		Embedded Nature of Science
		SC.3.N.1.4
		SC.3.N.1.5
			classify
			classification system
			cones
			conifer
			flowering
			nonflowering
			plant reproduction
			seeds
			spores

Animal Classification	*Classify animals into major groups (mammals, birds, reptiles, amphibians, fish arthropods, vertebrates, and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors.*
	Students will:
	• **discuss** how scientists use physical characteristics and behaviors to group animals (e.g., fur, feathers, number of legs, lay eggs, nurse young).
	• **discuss** the benefits of scientists sharing the same grouping system (classification).
	• **classify** animals into major groups according to their characteristics:
	  ○ vertebrates (fish, amphibians, reptiles, birds, mammals)
	  ○ invertebrates (arthropods - segmented bodies, jointed legs, and hard outer coverings)
	  NOTE: Arthropods are the only invertebrate group Grade 3
		SC.3.L.15.1
		
		Embedded Nature of Science
		SC.3.N.1.4
		SC.3.N.1.5
			amphibians
			animal
			arthropod
			backbone
			birds
			cold-blooded
			fish
			invertebrate
			mammals
			reptiles
			vertebrate
			warm-blooded

	students need to be able to classify. ○ other categories (live births/egg laying; feathers/scales/fur/skin/outside skeleton; warm-blooded/cold-blooded; lungs/gills, skeleton/hard outer covering).		
Adaptations	*Describe how **animals and plants** respond to changing seasons.* ***Students will:*** • **describe** how animals are adapted to respond when changes occur in the environment (e.g., hibernation, migration, shedding, birth, color change). • **explain** why animals are adapted to respond to seasonal changes in the environment (to increase the chance of survival). • **discuss** why it is important for scientists from around the world to communicate and compare the changes in animals from season to season. ***Students will:*** • **describe** how plants are adapted to respond when changes occur in the environment (e.g., drop leaves, dormancy, color change, flower and fruit production, germination, plant growth). • **explain** why plants are adapted to respond to changes in the environment (to increase the chance survival). • **discuss** why it is important for scientists from around the world to communicate and compare the changes in plants season to season. • **compare** how animals and plants respond to changes in the environment.	**SC.3.L.17.1** Embedded Nature of Science SC.3.N.1.4	**adapt** **adaptations** **dormant** **germinate** **hibernate** **migrate** **seasonal changes** **seasons**

Resource Alignment	Plant Classification	Animal Classification	Adaptations
Pearson Teacher's Edition	pg. 166cTE	pg. 174cTE	pg.182cTE, 190cTE
Pearson Student's Edition	pg. 167-171	pg. 174-179	pg. 182-187, 192-198
Hand's-on student Activities & Labs	pg. 167	pg. 175	pg. 183, 188-189, 191, 208-209
Content Limits for Standards	• Items will not require the classification of animals beyond the initial invertebrates grouping. • Items referring to classification of vertebrates will only assess general physical characteristics and/or behaviors of mammals, birds, reptiles, amphibians, and fish. Items addressing and/or assessing the functions of organs or the		• Items referring to the adaptation of organisms to different environments may address but will not assess the different stages of the organism's life cycle. • Items may require knowledge of how

	comparison of physical structures are limited to the brain, heart, lungs, gills, stomach, liver, intestines, pancreas, muscles, bones, exoskeleton, testes, ovaries, kidneys, bladder, skin or body covering, eyes, ears, nose, and tongue. • Items referring to the functions of plant structures are limited to flower, fruit, leaf, root, stem, seed, and spore. • Items addressing the comparison of the structure and/or function of plants and animals are limited to skin compared to plant covering, skeleton compared to stem, and reproductive organs compared to flower. • Items will not require specific knowledge of the parts of organs.		animals living in a environment are adapted to survive the seasonal changes in that environment. • Items will not assess renewable or nonrenewable resources.
Daily & Key Questions	***How Can We Classify Plants?*** **How are plants classified by scientists?** scientists classify plants into two groups, flowering and nonflowering according to how they reproduce. Flowering plants reproduce by forming seeds in fruits, vegetables or nuts. The seed consists of a young plant and a food supply enclosed in a protective seed coat. Nonflowering plants reproduce from seeds formed in pine cones (coniferous trees like pines, redwoods and spruce). Their seeds are naked with no food supply and a thin protective coating	**How Can We Classify Vertebrates?** **How Can We Classify Invertebrates?** **How Do You Classify Things?** **What are vertebrates?** animals are divided into two large groups or phylum: vertebrates (those with backbones) and invertebrates (those without backbones). Vertebrates take their name from the bones called vertebrae that make up their backbone. These bones which have a space at their center surround and protect the spinal cord. Mammals, fish, amphibians, reptiles, and birds are all vertebrates. In addition to a backbone, these animals also have other bones (skeletal system) that help support their bodies and protect important organs	***How Do Living Things Change with the Seasons? What Do Plants Need?*** **How Do Plants and Animals Get Energy?** **How does the change of seasons affect plants?** summer and spring when temperatures are warmer and there is more rain, plants grow new leaves, form flowers and produce seeds. In the fall and winter as temperatures get cooler plants drop their fruits and shed their leaves **How does the change of seasons affect animals?** summer and spring when temperatures are warmer and there is more rainfall, animals are active, eating, mating and raising their offspring. In the fall and winter as temperatures get cooler animals store food for winter, grow thicker coats of fur and hibernate when temperatures drop below freezing
Teacher Hints	• Develop a student made classification key to identify a plant by how it reproduces (dichotomous key or field guide). • Many students do not associate trees, shrubs and grasses as being classified as plants. Develop a definition of a plant as a class to identify plants. • Plants can produce their own food. Not all plants have the same structures (roots, stem, leaves, and flowers/cones/spores). A cactus would be an example of a plant to use when answering this question. Compare different plants and describe how their	• Students often have misconceptions about what is and is not an animal. Students often do not think insects, humans, or sponges are animals. Create a definition of animals to include the following: living, can move, feed on other organisms, reproduce with eggs or live birth. • Begin teaching classification using everyday items. The grocery store organization or alphabetical files in the media center are	• Compare and contrast different species of animals, such as bears, found in different climates (e.g., polar bears/black bears) to determine how their behaviors and physical characteristics are adapted to these environments. • Review the seasons of the year and typical weather conditions for each. This will serve as foundational knowledge for SC.3.L.17.1. • *The terms migration* and *hibernation* are often confused. Migration is movement from one location to another. Hibernation is an extended period of sleep where an animal's body slows way down.

	differences give plants advantages over other plants. • Have students research how plants change during the four seasons. • Students are to understand why it is important for scientists to communicate and agree on a common classification system. For example, a discovery of a new plant species by a scientist in Japan needs to be communicated with other scientists around the world and classified using the same system to communicate most effectively. • This classification system is in Latin and used and understood by scientists all over the world, regardless of the language each speaks.	examples. Discuss the purpose of classification. • Know the critical attribute (defining characteristic) for each group of vertebrates: mammals (produce milk for nursing), birds (have feathers), amphibians (begin life as eggs in the water but then lives on land), reptiles (scales and leathery skin), fish (have gills). The critical attribute for each group is common to all species within the group. • A warm-blooded animal can regulate its body temperature. A cold-blooded animal cannot regulate its body temperature. • Students are to understand why it is important for scientists to communicate and agree on a common classification system. For example, a discovery of a new animal species by a scientist in Japan needs to be effectively communicated and understood by other scientists around the world. This also holds true for knowing how to classify animals using the same system so that all the scientists use the same system of classification when grouping animals. • Students will not have to memorize invertebrate groups but should be able to use a classification key to identify arthropods (e.g., insects, arachnids, crustaceans). Arthropods have jointed legs, segmented bodies, and hard, outer coverings. • Examples of arthropods may include, but are not limited to, the following: bees, flies, cockroaches, spiders,	Not all animals that we typically associate with hibernation hibernate such as the Florida Black Bear. • Research different animals that migrate (e.g., monarch butterflies, humpback whales, caribou, turtles, penguins). Find out during which seasons they migrate and where they go. Discuss what would happen if they did not migrate.

		lobster, shrimp, and crayfish. • Animals sorts – plastic animals and/or cards • Bring science into writing – informational piece on arthropods.	
Books	Disgusting Plants by Connie Colwell Miller, Capstone, 2007 From Seed to Daisy: Following the Life Cycle by Laura Purdie Salas, Picture Window, 2008 Oak Tree by Gordon Morrison, Houghton Mifflin, 2000	The Magic School Bus Chapter Book: *Insect Invaders* (Scholastic Publishing) Actual Size by Steve Jenkins, Houghton Mifflin Harcourt, 2004 Slugs by Anthony D. Fredericks, Lerner, 2000 Gulls…Gulls…Gulls by Gail Gibbons, Holiday House, 2001	*How to Hide a Meadow Frog* by Ruth Heller
Thinking Maps ®	Bubble Map (identifying a specific plant); Tree Map (list different types of plants and their details); Double Bubble (compare seed plant with spore plant); Brace Map (parts of a plant)	Bubble Map (individual animal and their characteristics); Tree Map (list different animal classification); Brace Map (invertebrate characteristics)	Double Bubble Map (leaf comparison); Tree Map (classifying adaptations); Multi-flow Map (color of leaf change throughout the season)
CPALMS		*What Am I? Classifying Living Things*	*Do Not Disturb! A Lesson on Hibernating and Migration*
Web Resources	Scholastic Study Jams: *Plants with Seeds* Scholastic Study Jams: *Flowers* Scholastic Study Jams: *Plants Without Seeds* Try Science Experiment - *Animal Attraction*	Scholastic Study Jams: *Vertebrates* Scholastic Study Jams: *Invertebrates* Scholastic Study Jams: *Arthropods* Brain Pop Jr.: *Classifying Animals* *Animals Belong in a Class*	Brain Pop Jr.: *Hibernation* *Brain Pop Jr.: Migration* *Brain Pop Jr.: Plant Adaptations* *Nature's Best Camouflages Video* *Animal Adaptation Adventure* *https://kids.nationalgeographic.com/videos/wild-kids-tv/* *http://kids.sandiegozoo.org/*

Third Grade Suggested Scope and Sequence

NGSS Body of Knowledge: Nature of Science
Unit of Study: Enrichment with Science (5 weeks)

Prerequisite Learning: Kindergarten – SC.K.N.1.1, SC.K.N.1.2, SC.K.N.1.3, SC.K.N.1.4, SC.K.N.1.5
First Grade – SC.1.N.1.1, SC.1.N.1.2, SC.1.N.1.3, SC.1.N.1.4, SC.1.E.5.3
Second Grade – SC.2.N.1.1, SC.2.N.1.2, SC.2.N.1.3, SC.2.N.1.4, SC.2.N.1.5, SC.2.N.1.6

Topics	Learning Targets/Skills	Standard(s)	Vocabulary
Put Science Skills to use with Enrichment	*Infer based on observation.* ***Students will:*** • **predict** the identity of a mystery (unknown) event/object/substance before making extensive observations. • **make** observations of a mystery event/object/substance. • **make** inferences based on observations of the mystery event/object/substance. • **justify** inferences made (reasons for results of the scientific study of the event/object/substance). • **discuss** the importance of observations when making inferences. *Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.* ***Students will:*** • **summarize** observations made by two different groups who have conducted the same investigation using the same tools. • **compare** observations (similarities and differences) made by two different groups using the same tools. • **explain** why there may be differences in observations between groups.	**SC.3.N.1.6** **SC.3.N.1.2**	**infer/inference** **mass (weight)** **observe/observation** **predict/prediction** **scientific tools** ○ balance scale ○ beaker ○ eyedropper ○ flask ○ forceps ○ gloves ○ goggles ○ graduated cylinder ○ hand lens ○ magnet ○ measuring cup ○ meter stick ○ metric ruler ○ microscope ○ spring scale ○ stopwatch ○ tape measure ○ thermometer **temperature** **time** **volume**
Science Process	*Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.* ***Students will***: • **generate** testable questions about the world around them (e.g., "What happens when…?, "What if…?", "What affects …?", and "How do objects compare?"). • **form** a hypothesis before investigating a student-generated	**SC.3.N.1.1**	**compare** **explanation** **explore** **interpret** **investigate** **observations** **prediction** **record**

	question. • **investigate** testable, student-generated questions through free exploration and teacher- designed investigations using a procedure (steps). • **compare** free-exploration investigations to more formal explorations (e.g., teacher-directed, use of the scientific method). • **use** the steps of the scientific method (testable question, hypothesis, experiment-materials and procedure, data, results, conclusion). • **generate** appropriate explanations based on observations (data) collected during the exploration/investigation. • **explain** why scientists perform multiple trials to gather data to support conclusions.		**scientific method** ○ **testable question** ○ **hypothesis** ○ **experiment** ▪ **materials** ▪ **procedure** ○ **data/evidence** ○ **results** ○ **conclusion** **trials**
Science Process	*Recognize that scientists use models to help understand and explain how things work.* *Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations.* ***Students will:*** • **compare** a model of an object with the real object using similarities and differences (e.g., earthworm vs. a gummy worm, toy car vs. a real car, or a model train vs. a real train). • **explain** how some models are larger than the real object while other models are smaller than the real object. • **explain** that not all models account perfectly for all attributes of real objects. • **discuss** why scientists use models (to help understand and explain how things work).	**SC.3.N.3.2** **SC.3.N.3.3**	**2-dimensional model** **3-dimensional model**
Data	*Explain that empirical evidence is information, such as observations or measurements, that is used to help validate explanations of natural phenomena.* *Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.* ***Students will:*** • **define** empirical evidence (data which is acquired through careful observation using the five senses and scientific tools that enhance the senses during an investigation). • **discuss** with a partner or in small groups an appropriate way to collect data for a teacher- selected investigation. • **construct** an appropriate data collection tool (e.g., chart, table) that could be used during the investigation.	**SC.3.N.1.7** **SC.3.N.1.3**	**accuracy** **communication** **compare** **conclusions** **data (evidence)** **interpret** **models** **observations** **predictions** **questions**

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record data collected during the investigation in science notebooks (e.g., written, pictorial, simple charts/graphs).
display data in a bar graph (if appropriate) and present to classmates.
analyze and interpret data collected during the investigation to formulate an explanation of the results.
explain the importance of good record keeping (used to form explanations).

Recognize that scientists' question, discuss, and check each other's evidence and explanations. Recognize the importance of communication among scientists.
Students will:

identify ways that scientists share their knowledge and results with one another (e.g., lab reports, journals, articles, conversations).
describe why and how scientists collaborate to gain new knowledge or refine ideas (e.g., laboratories, field stations, conferences).
collaborate with another lab group to question, discuss, and check others' evidence and explanations to demonstrate the importance of communicating with other scientists.
recognize the importance of checking evidence for accuracy.
provide reasoning as to why scientists may differ in their evidence and explanations (e.g., use of different kinds of tools, consistency in using the same tool for an experiment, human error, living in different parts of the world).
explain that explanations of results can vary even when scientists are analyzing the same evidence (i.e., scientists drawing their own conclusions based on the data).

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Teacher Hints for "Practice of Science Enrichments":

Use the scientific process to enjoy investigations:

How do you float an egg? What questions can be generated as the egg begins to float?
What is the effect of various liquids on egg shells?
How do gummy bears respond in different liquids?
How many pennies can you float in an aluminum foil boat?
Use rulers as ramps and marbles for cars. Test different variables. You may also wish to replace rulers with pipe insulation.
Design a parachute to remain in the air the longest amount of time.
Design paper columns to hold objects of different weights.

Provide opportunities for student-lead investigations:
1.) Provide students with a set of materials that can be used for many investigations.
2.) Student groups brainstorm and generate scientific questions to investigate.

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3.) Student groups choose one question to investigate and produce a procedure collaboratively.
4.) Conduct the investigations.
5.) Record and share data and results.

Resources: Just for YOU!

Science Process Skills: Basic and Integrated

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

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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

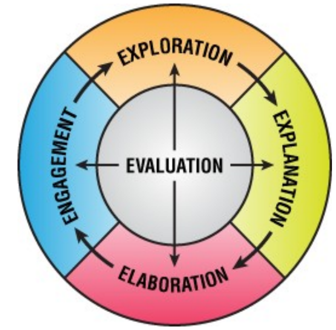
Acquiring Data: collecting qualitative and quantitative data as observations and measurements

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	Evaluation of Exploration	Evaluation of Explanation	Evaluation of Elaboration	
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.	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.	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.	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 in words or diagrams a scientific concept or relationship. • 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 time 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.

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______?

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

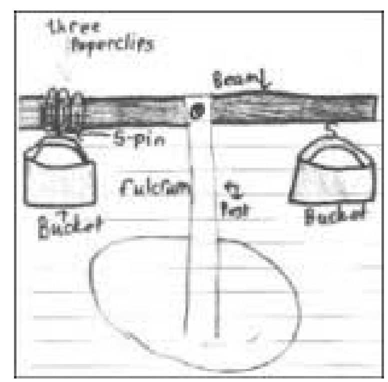
What information can you gather to support your idea about______?
Apply information from one text to another text to develop a persuasive argument.
Write a research paper/thesis on a topic from multiple sources.
Judge the value of material for a given purpose.
Consider multiple lines of inquiry to explain 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.

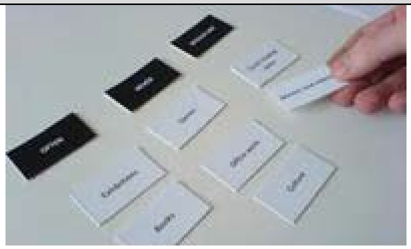
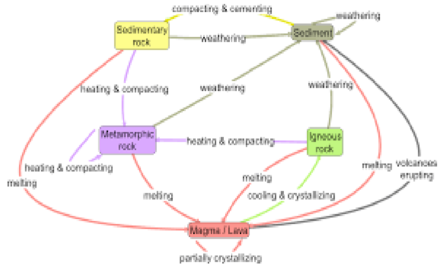
Formative Assessment Strategies

APPENDIX A

Science K-5

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

Strategy Name	Description	Additional Information
A & D Statements	*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.	
Agreement Circles	*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.	**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 must move in order to have energy.
Annotated Student Drawings	*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.	

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.	

Strategy Name	Description	Additional Information
Concept Cartoons	*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.	 www.pixton.com
Data Match	*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.	**Where We Put the Ice Cube** — **How Many Minutes It Took to Melt** On the blacktop in the sun — 3 On the blacktop in the shade — 7 On the grass — 10 On the metal side — 2 On the dirt underneath the slide — 5 **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.

Fact First Questioning	*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.	**Examples of Fact First Questions** Glucose is a form of food for plants. Why is glucose considered a food for plants? A cell is called the basic unit of life. Why is the cell called the basic unit of life? The patterns of stars in the night sky stay the same. Why do the patterns of stars in the night sky stay the same? Sandstone is a sedimentary rock. Why is sandstone considered a sedimentary rock?

<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></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><u>P</u>lants make their own food.</td><td>Producers such as plants use energy from the sun to make their food.</td></tr>
<tr><td><u>H</u>appens in cells</td><td>Happens in cells that have structures called chloroplasts</td></tr>
<tr><td><u>O</u>ther animals eat plants.</td><td>Organisms that eat plants are using energy from the plant.</td></tr>
<tr><td><u>T</u>he 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><u>O</u>xygen is breathed in through leaves.</td><td>Oxygen is given off during photosynthesis and is used by plants and animals for respiration.</td></tr>
</table></td></tr>
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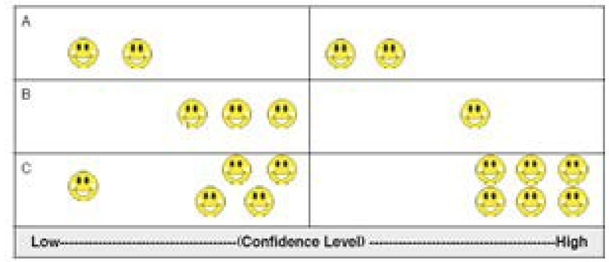
Strategy Name	Description	Additional Information	
First Word-Last Word		**S**unlight makes food for plants.	Sunlight provides the energy so plants can make food.
		You can't make your own food.	You need to have cells with chloroplast and chlorophyll to make food.
		Needs water, sunlight, oxygen, and minerals	Needs water, carbon dioxide and sunlight to make food
		The leaves, roots, and stems are all parts that make food.	The leaf is the food making part.
		Have to have sun and water	Have to have sunlight, water, and carbon dioxide
		Energy comes from the sun.	Energy comes from sunlight.
		Sunlight turns plants green.	Sunlight is trapped in the chlorophyll.
		It happens in all plants.	It is necessary life process for all plants.
		Soil is used by plants to make food.	Soil holds the water for plants and gives some minerals.

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.	 I do not understand it. / I understand some of it. / I understand most of it. / I understand it completely. / I understand it and can explain it.
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.	Agree — Strongly Agree Strongly Disagree — Disagree

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.	Definition Characteristics **Living Things** Examples Non-examples
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.

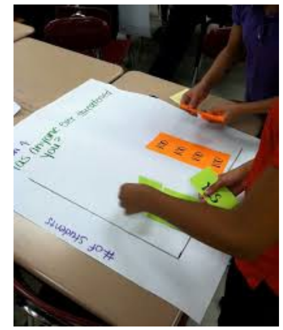
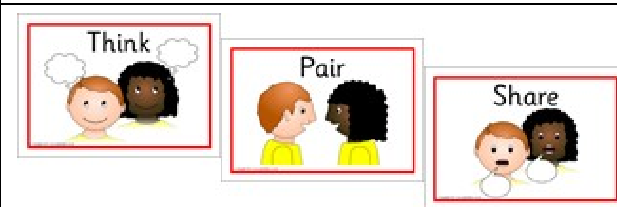
Strategy Name	Description	Additional Information
Give Me Five	*Give Me Five* is a simple, quick technique for inviting and valuing public reflection and welcoming feedback from the students. Students should be given time to quietly reflect, perhaps through a quick write. Teacher selects five "volunteers" to share their reflection. NOTE: Deliberately select students for the purpose of reinforcing correct understanding and addressing misconceptions.	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?

Human Scatterplot	*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.	
I Used to Think… But Now I Know…	*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.	
Justified List	*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.	**Making Sound** All of the objects listed below make sounds. Put an X next to the objects you think involve vibration in producing sound. ____guitar strings ____drum ____piano ____dripping faucet____flute ____wind ____hammer ____crumpled paper ____thunderstorm ____barking dog ____screeching brakes Explain your thinking. What "rule" or reasoning did you use to decide which objects involve vibration?

Strategy Name	Description	Additional Information

K-W-L Variations	*K-W-L* is a general technique in which students describe what they **K**now about a topic, what they **W**ant to know about a topic, and what they have **L**earned 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.	
Learning Goals Inventory (LGI)	*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.	
Look Back	*Look Back* is a recount of what students learned over a given instructional period of time. 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.	
Muddiest Point	*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.	**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."*

Strategy Name	Description	Additional Information
Odd One Out	*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.	Properties of Matter: In each set, circle the ***Odd One Out*** and describe why it does not fit with the others.
Paint the Picture	*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.	What role do minerals play in the formation of a rock? minerals rock
Partner Speaks	*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.	**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.**
Pass the Question	*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.	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?
A Picture Tells a Thousand Words	*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.	

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.	

Strategy Name	Description	Additional Information
Traffic Light Cups	*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.	
Two-Minute Paper	*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.	• 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?
Two Stars and a Wish	*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.	
3-2-1	*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.	**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**