Welcome to the Grade 3 Science Planning Guide for 2013-2014!

Last year, CPS teachers of science were encouraged to begin integrating the Science and Engineering Practices into their instruction as we began to lay the foundation for the publication and adoption of the Next Generation Science Standards (NGSS). The Practices (defined in *A Framework for K-12 Science Education* and explained earlier in this document) represent one of the most substantial challenges to the implementation of the NGSS.

We know that college readiness begins in elementary school. Research in elementary science learning shows the importance of providing the hands-on, inquiry-based science learning opportunities that the NGSS expects. When third grade students are engaged in doing the kinds of science expected by NGSS, they will talk about what they are doing, they will write about it, and they will defend the conclusions they have drawn from evidence. These types of activities all appear in the Common Core State Standards for Literacy (CCSS-L). In a similar way, the Standards for Mathematical Practice that are part of the Common Core State Standards for Mathematics (CCSS-M) are also addressed when students do hands-on, inquiry-based science, because the Standards for Mathematical Practice are tightly aligned with the Science and Engineering Practices. The designers of the NGSS were very deliberate about connecting the new science standards to the new standards for literacy and mathematics. This means that when science instruction is aligned with NGSS expectations, students can develop the deeper understandings required to reason, analyze, and communicate their thinking, all of which are expected by the literacy and mathematics Common Core State Standards. The grade 3 science connections to CCSS-L and CCSS-M can be found on page 96.

2013-2014 marks the first year in our implementation of the new science standards. This guide reflects the input of many CPS educators who considered the best ways to facilitate the transition to NGSS, which raise the bar substantially on science teaching and learning. As the content and approaches outlined in this guide are implemented, students in science classrooms across the District will be challenged in new ways, as we provide more opportunities for them to learn by doing real science, guided by NGSS expectations.

Please take the time to read the important information pertaining to all K-8 CPS Science Planning Guides, including how to read the sample student outcome statements that you'll find in each unit. The overview to these guides starts on page 29. By becoming familiar with the District's expectations regarding the use of the CPS Science Planning Guides and our transition to the NGSS described there, we can begin to address the critical shifts that need to occur in every science classroom if we are going to meet the challenge that NGSS set out for us.

Table of Contents

Unit 1: Water and the Water Cycle

From *A Framework for K-12 Science Education*	Science and Engineering Practices	Disciplinary Core Ideas ▪ Component Ideas	Crosscutting Concepts
	1. Asking questions (for science) and defining problems (for engineering) 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations (for science) and designing solutions (for engineering) 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	ESS1: Earth's Place in the Universe ▪ ESS1.C: The History of the Planet ESS2: Earth's Systems ▪ ESS2.A: Earth Materials and Systems ▪ ESS2.C: The Roles of Water in Earth's System Interactions ▪ ESS2.D: Weather and Climate PS1: Matter and Its Interactions ▪ PS1.A: Structure and Properties of Matter ETS1: Engineering Design ▪ ETS1.A: Defining and Delimiting an Engineering Problem ▪ ETS1.B: Develop Possible Solutions ▪ ETS1.C: Optimizing the Design Solution	1. Patterns 2. Cause and effect: Mechanism and explanation 3. Scale, proportion, and quantity 4. **Systems and system models** 5. **Energy and matter: Flows, cycles, and conservation** 6. Structure and function 7. **Stability and change**

IL State Learning Standards	Content	Skills
	12.C Know and apply concepts that describe properties of matter and energy and the interactions between them. 12.C.2b Describe and explain the properties of solids, liquids, and gases. 12.D Know and apply concepts that describe force and motion and the principles that explain them. 12.D.2b Demonstrate and explain ways that forces cause actions and reactions.	11.A Know and apply the concepts, principles, and processes of scientific inquiry. 13.A Know and apply accepted practices of science. 13.B Know and apply concepts that describe the interaction between science, technology, and society.

Sample Student Outcome Statements*	***Students will be able to:***
	▪ Ask questions ... to research and discuss the forms water can take using appropriate grade level print material. RI.3.10, W.3.7 ▪ Develop … a model to demonstrate how **evaporation and condensation contribute to the water cycle;** update the model as additional information is obtained. **(Energy and matter: Flows, cycles, and conservation)** ▪ Plan an investigation … to observe how environments and temperatures affect the rate of evaporation of water. ▪ Plan and carry out … an investigation to compare the density of water at different temperatures. ▪ Communicate … information orally and in writing about the **density of water at different temperatures. (Stability and change)** W.3.2, SL.3.1 ▪ Plan and carry out … Investigations that test various materials for their absorbency. ▪ Engage in argument from evidence … about the level of absorbency of the materials tested. SL.3.1, SL.3.3, SL.3.4 ▪ Obtain information through observations … to compare the absorbency rate of various materials. MP.7 ▪ Use mathematics … to measure the volume of water. MP.1, MP.5 ▪ Analyze observational data … in writing about **rate of evaporation, density, and absorbency** and share with others using accurate vocabulary. **(Energy and matter: Flows, cycles, and conservation)** W.3.2, L.3.6 ▪ Ask questions … to research and discuss the various machines designed to use water to do work using appropriate grade level print material. W.3.7 ▪ Plan, design, and construct … a **system to use water to lift objects**. + **(Systems and system models)** MP.1 ▪ Plan and carry out an investigation ... to test the systems that use water to lift objects to determine which is most effective. + MP.1, MP.5 ▪ Communicate and evaluate … the systems that use water to lift objects, comparing strengths and weaknesses to select the most effective using accurate vocabulary. + SL.3.1, SL.3.2, SL.3.3
	* *All student outcome statements connect Science and Engineering Practices with the appropriate science content (and practices are underlined). In some student outcome statements, representative Crosscutting Concepts (and reference words) are bolded.* + *Indicates an engineering statement*

Key Ideas	
	▪ Water exists as solid, liquid, and gaseous form on Earth. (ESS2.C) ▪ Water can be **absorbed** by some materials. (PS1.A) ▪ Water has observable properties and characteristics. (PS1.A) ▪ **Temperature** causes water to **expand** or **contract**. (PS1.A) ▪ Temperature and **density** affect an object's ability to float or sink. (PS1.A) ▪ Water can be used to do work. (ESS2.C) ▪ **Evaporation** is the process by which water, a liquid, changes into **water vapor**. (ESS2.C, ESS2.D) ▪ **Evaporation** and **condensation** contribute to the movement of water through the **water cycle**. (ESS2.C, ESS2.D) ▪ One of the Earth's systems is the **hydrosphere**. (ESS2.A) ▪ Earth's systems interact to affect Earth's surface materials and processes. (ESS1.C, ESS2.A) ▪ Scientists back up their **claims** with **evidence** that can be confirmed. (ETS1.A) ▪ The results of the same **scientific investigations** are seldom exactly the same, but if the differences are great, it is important to try to figure out why. (ETS1.B, ETS1.C)

	▪ Scientists communicate to inform others about their work, open their work up to **constructive criticism** of peers, and to help each other stay informed about scientific discoveries in the world. (ETS1.C) Additional academic vocabulary: **pressure, molecule, water pressure, more dense, less dense**
	Key ideas track to Component Ideas (of Disciplinary Core Ideas) (e.g., PS1.A), drawn from A Framework for K-12 Science Education. *Key terms are bolded above. They should be deeply understood within the context of their use. Not to be considered for standalone vocabulary exercises.* Resource: AAAS document

Prior Knowledge	▪ Water takes on various forms. ▪ Water is affected by temperature. ▪ Scientists use magnifiers to help them see things they couldn't see without them. ▪ Scientists learn about things by observing them over time and keeping a record of their observations. ▪ Scientists use journals to record their observations accurately in writing or with drawings. ▪ Scientists discuss strengths and weaknesses in their designs. ▪ Scientists sometimes learn about things around them by doing something to the things and observing what happens ▪ Scientists compare their observations with observations of others.

Possible Misconceptions	▪ Students may believe that when water evaporates it ceases to exist. ▪ There may be confusion about water evaporating only from large bodies of water (oceans, lakes, ponds, rivers). ▪ Students may think that clouds, fog, and frost are condensed water vapor.

Possible Summative Assessments	Plan, construct, and explain a model that shows how water moves from solid to liquid to gas in our world.

Unit 2: Earth Materials and Their Uses

From *A Framework for K-12 Science Education*	Science and Engineering Practices	Disciplinary Core Ideas ▪ Component Ideas	Crosscutting Concepts
	1. Asking questions (for science) and defining problems (for engineering) 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations (for science) and designing solutions (for engineering) 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	ESS1: Earth's Place in the Universe ▪ ESS1.C: The History of Planet Earth ESS2: Earth's systems ▪ ESS2.A: Earth Materials and Systems ▪ ESS2.B: Plate Tectonics and Large-Scale System Interactions PS1: Matter and Its Interactions ▪ PS1.A: Structure and Properties of Matter ETS1: Engineering Design ▪ ETS1.A: Defining and Delimiting an Engineering Problem ▪ ETS1.B: Developing Possible Solutions ▪ ETS1.C: Optimizing Design Solution	1. **Patterns** 2. **Cause and effect: Mechanism and Explanation** 3. **Scale, proportion, and quantity** 4. Systems and system models 5. Energy and matter: Flows, cycles, and conservation 6. **Structure and function** 7. Stability and change

IL State Learning Standards	Content	Skills
	12.C Know and apply concepts that describe properties of matter and energy and the interactions between them. 12.C.2b Describe and explain the properties of solids, liquids, and gases. 12.D Know and apply concepts that describe force and motion and the principles that explain them. 12.D.2b Demonstrate and explain ways that forces cause actions and reactions.	11.A Know and apply the concepts, principles, and processes of scientific inquiry. 11.B Know and apply the concepts, principles, and processes of technological design. 13.A Know and apply accepted practices of science. 13.B Know and apply concepts that describe the interaction between science, technology, and society.

Sample Student Outcome Statements*	***Students will be able to:***
	▪ Ask questions ... to research and discuss the **properties of minerals** using appropriate grade level print material. + **(Patterns)** RI.3.10, W.3.7 ▪ Communicate … information orally and in writing about the properties of minerals to peers. + W.3.2, SL.3.1 ▪ Develop a model … to **seriate rocks based on mass, diameter, circumference, hardness**, etc.; update the model as additional information is obtained. **(Patterns, Scale, proportion, and quantity)** MP.7 ▪ Plan an Investigation ... to observe and test for **properties of minerals that are used to identify the composition of rocks**. + **(Structure and function)** ▪ Use mathematics ... to measure the mass, length, diameter of rocks. MP.1, MP.5 ▪ Plan and carry out ... an investigation to **categorize rocks by their mineral composition**. **(Patterns)** ▪ Communicate ... information orally and in writing about the properties of minerals used to identify rocks. W.3.1, SL.3.1 ▪ Plan and carry out ... investigations that **identify rocks using the properties of the minerals of which they are composed**. **(Structure and function)**

Sample Student	***Students will be able to:***
	▪ Ask questions ... to research and discuss the **ways weathering of rocks can happen** using appropriate grade level print material. **(Cause and effect: Mechanism and explanation)** W.3.7 ▪ Obtain information through observations ... to compare the mineral compositions of various rocks. ▪ Engage in argument from evidence … about comparison of the mineral compositions of various rocks. SL.3.1, SL.3.3, SL.3.4 ▪ Analyze observations ... in writing about properties of minerals using accurate vocabulary. W.3.2 ▪ Design ... a test to determine **which rocks stand up to the process of weathering best**. **(Cause and effect: Mechanism and explanation)**
	* *All student outcome statements connect Science and Engineering Practices with the appropriate science content (and practices are underlined). In some student outcome statements, representative Crosscutting Concepts (and reference words) are bolded.* + *Indicates an engineering statement*

Key Ideas	
	▪ **Rocks** and **minerals** are the solid materials that form Earth. (ESS2.A) ▪ Earth materials, **rocks** and **minerals**, have observable **properties** color, shape, and texture. (PS1.A) ▪ **Rocks** (**sedimentary rock**, **igneous rock**, **metamorphic rock**) are made of **minerals**. (PS1.A, ESS2.B) ▪ **Minerals** as well as **rocks** have observable characteristics by which they can be identified and categorized. (PS1.A) ▪ The **properties** of **minerals** can be used to find out which minerals are in a rock. (PS1.A) ▪ **Rocks** can be reduced to their **component parts**. (PS1.A, ESS2.A) ▪ **Weathering** can reduce rocks to their **component parts**. (ESS1.C, ESS2.A) ▪ **Minerals** cannot be physically broken apart into **components**. (PS1.A) ▪ Scientists back up their **claims** with **evidence** that can be confirmed. (ETS1.A) ▪ The results of the same **scientific investigations** are seldom exactly the same, but if the differences are great, it is important to try to figure out why. (ETS1.B, ETS1.C) ▪ Scientists communicate to inform others about their work, open their work up to **constructive criticism** of peers, and to help each other stay informed about scientific discoveries in the world.(ETS1.C) Additional academic vocabulary: **geologist, dissolve, evaporate, crystal, sediment, geology**
	Key ideas track to Component Ideas (of Disciplinary Core Ideas) (e.g., PS1.A), drawn from A Framework for K-12 Science Education. *Key terms are bolded above. They should be deeply understood within the context of their use. Not to be considered for standalone vocabulary exercises.* Resource: AAAS document

Prior Knowledge	▪ Rocks, soil, and sand are present in most areas of Earth. ▪ Rocks come in many sizes and shapes. ▪ Rocks have observable properties that can be used to sort them. ▪ Rocks can be sorted using various tools. ▪ Rocks are the solid material of Earth. ▪ Earth materials are natural resources. ▪ Earth materials are used in the construction of things around us based on their suitability. ▪ Scientists use magnifiers to help them see things they couldn't see without them. ▪ Scientists learn about things by observing them over time and keeping a record of their observations. ▪ Scientists use journals to record their observations accurately in writing or with drawings. ▪ Scientists discuss strengths and weaknesses in their designs. ▪ Scientists sometimes learn about things around them by doing something to the things and observing what happens ▪ Scientists compare their observations with observations of others.

Possible Misconceptions	▪ Some students may believe that minerals and rocks are the same. ▪ There may be some confusion about all rocks being made of the same thing.

Possible Summative Assessments	▪ Compare and categorize several rocks and minerals based on their properties and provide evidence for category choices.

Unit 3: Sound

	Science and Engineering Practices	Disciplinary Core Ideas ▪ Component Ideas	Crosscutting Concepts
From A Framework for K-12 Science Education	1. Asking questions (for science) and defining problems (for engineering) 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations (for science) and designing solutions (for engineering) 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	PS2: Motion and Stability: Forces and Interactions ▪ PS2.A: Forces and Motion ▪ PS2.D: PS3: Energy ▪ PS3.A: Definitions of Energy ▪ PS3.B: Types of Interactions ▪ PS3.C: Relationship Between Energy and Forces PS4: Waves and Their Applications in Technologies for Information Transfer ▪ PS4.A: Wave Properties LS1: From Molecules to Organisms: Structures and Processes ▪ LS1.A: Structure and Function ▪ LS1.D: Information Processing ETS1: Engineering Design ▪ ETS1.A: Defining and Delimiting an Engineering Problem ▪ ETS1.B: Developing Possible Solutions ▪ ETS1.C: Optimizing the Design Solution ▪	1. Patterns 2. **Cause and effect: Mechanism and Explanation** 3. Scale, proportion, and quantity 4. Systems and system models 5. **Energy and matter: Flows, cycles, and conservation** 6. Structure and function 7. Stability and change

IL State Learning Standards	Content	Skills
	12.C Know and apply concepts and describe properties of matter and energy and the interactions between them. 12.C.2a Describe and compare types of energy including light, heat, sound, electrical, and mechanical.	11.A Know and apply the concepts, principles, and processes of scientific inquiry. 11.B Know and apply the concepts, principles, and processes of technological design. 13.A Know and apply accepted practices of science. 13.B Know and apply concepts that describe the interaction between science, technology, and society.

Sample Student Outcome Statements*	***Students will be able to*:**
	▪ Ask questions ... to research and discuss the properties of sound using appropriate grade level print material. RI.3.10, W.3.7 ▪ Plan and carry out … an Investigation to observe and test **which media sound travels through the loudest**. + **(Energy and matter: Flows, cycles, and conservation)**

Sample Student	***Students will be able to*:**
	▪ Communicate and evaluate … information orally and in writing about observations of sound traveling through different media, examining the differences in **loudness of the sounds heard in different media**. + **(Energy and matter: Flows, cycles, and conservation)** W.3.2, SL.3.1, SL.3.3 ▪ Plan and carry out … investigations about identifying sounds detected by using our ears. ▪ Design … a test to determine which sounds our ears can hear with the greatest frequency. ▪ Develop a model … that indicates how the least amount of sound would reach our ears, label all parts and explain how it works. + ▪ Ask questions ... to research and discuss the **variables that change the pitch of sound** using appropriate grade level print material. **(Cause and effect: Mechanism and explanation)** RI.3.10, W.3.7 ▪ Plan and carry out … Investigations to test the **variables that change the pitch of sound**. **(Cause and effect: Mechanism and explanation)** ▪ Communicate … information about observations to identify **variables that change the pitch of sound** with peers using accurate vocabulary. **(Cause and effect: Mechanism and explanation)** W.3.2, LS.3.1, L.3.6 ▪ Engage in argument from evidence … about the different **variables that change the pitch of sound**. **(Cause and effect: Mechanism and explanation)** SL.3.1, SL.3.3, SL.3.4 ▪ Use mathematics ... to measure the length of rubber bands (one of the variables students will discover that changes the pitch of sound) used to create sounds and graph data. MP.5 ▪ Analyze observational data … in writing about **variables that change the pitch of sound** using accurate vocabulary. **(Cause and effect: Mechanism and explanation)** W.3.4, L.3.6
	* *All student outcome statements connect Science and Engineering Practices with the appropriate science content (and practices are underlined). In some student outcome statements, representative Crosscutting Concepts (and reference words) are bolded.* + *Indicates an engineering statement*

Key Ideas	
	▪ Energy is present where there is sound. (PS3.A, PS3.B) ▪ Energy can be moved from place to place through sound. (PS3.A, PS3.B) ▪ Sound is caused by **vibrations** in its (**sound**) **source** transferred to the surrounding air. (PS3.A, PS3.B) ▪ Two or more sound waves can pass through a place travelling in different directions and not get mixed up. (PS3.A, PS4.A) ▪ Sounds have properties that make them identifiable. (PS3.A) ▪ Sound needs a **medium** to travel through. (PS3.A, PS3.B) ▪ Sound travels through media such as solids, liquids and gases. (PS3.A, PS3.B) ▪ **Sound receivers**, like our ears, detect sound **vibrations**. (LS1.A, LS1.D) ▪ **Pitch** is how high or low a sound is. (PS2.A, PS4.A) ▪ Differences in **pitch** are the result of changes in the size, **tension**, or thickness of the source material through which it is traveling. (PS2.D, PS3.B, PS3.C, PS4.A) ▪ Scientists back up their **claims** with **evidence** that can be confirmed. (ETS1.A) ▪ The results of the same **scientific investigations** are seldom exactly the same, but if the differences are great, it is important to try to figure out why. (ETS1.B, ETS1.C) ▪ Scientists communicate to inform others about their work, open their work up to **constructive criticism** of peers, and to help each other stay informed about scientific discoveries in the world. (ETS1.C)

	Additional academic vocabulary: **volume, frequency** *Key ideas track to Component Ideas (of Disciplinary Core Ideas) (e.g., PS1.A), drawn from* A Framework for K-12 Science Education. *Key terms are bolded above. They should be deeply understood within the context of their use. Not to be considered for standalone vocabulary exercises.* Resource: AAAS document

Prior Knowledge	▪ People can make sounds. ▪ We hear sounds around us all of the time. ▪ Sounds can be produced in many different ways. ▪ Things that make sound vibrate. ▪ Scientists learn about things by observing them over time and keeping a record of their observations. ▪ Scientists use journals to record their observations accurately in writing or with drawings. ▪ Scientists discuss strengths and weaknesses in their designs. ▪ Scientists sometimes learn about things around them by doing something to the things and observing what happens. ▪ Scientists compare their observations with observations of others.

Possible Misconceptions	▪ Some students may believe that sound cannot travel through a solid. ▪ Some students may believe that sound travels in one direction. • There may be some confusion about how to change the pitch of a sound an object emits.

Possible Summative Assessments	Use household materials to design a toy through which sound can travel.

Unit 4: Earth, Sun, Moon, and Stars

From *A Framework for K-12 Science Education*	Science and Engineering Practices	Disciplinary Core Ideas ▪ Component Ideas	Crosscutting Concepts
	1. Asking questions (for science) and defining problems (for engineering) 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations (for science) and designing solutions (for engineering) 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	ESS1: Earth's Place in the Universe ▪ ESS1.A: The Universe and Its Stars ▪ ESS1.B: Earth and the Solar System PS4: Waves and Their Applications in Technologies for Information Transfer ▪ PS4.B: Electromagnetic Radiation ▪ PS4.C: Information Technologies and Instrumentation ETS1: Engineering Design ▪ ETS1.A: Defining and Delimiting an Engineering Problem ▪ ETS1.B: Developing Possible Solutions ▪ ETS1.C: Optimizing the Design Solution ETS2: Links Among Engineering, Technology, Science, and Society ▪ ETS2.A: Interdependence of Science, Engineering, and Technology ▪ ETS2.B: Influence of Engineering, Technology, and Sciences on Society and the Natural World	1. **Patterns** 2. Cause and effect: Mechanism and Explanation 3. **Scale, proportion, and quantity** 4. **Systems and system models** 5. Energy and matter: Flows, cycles, and conservation 6. Structure and function 7. **Stability and change**

IL State Learning Standards	Content	Skills
	12.F Know and apply concepts that explain the composition and structure of the universe and Earth's place in it. 12.F.2a Identify and explain natural cycles and patterns in the solar system. 12.F.2b Explain the apparent motion of the sun and stars. 12.F.2c Identify easily recognizable star patterns.	11.A Know and apply the concepts, principles, and processes of scientific inquiry. 13.A Know and apply accepted practices of science. 13.B Know and apply concepts that describe the interaction between science, technology, and society.

Sample Student Outcome Statements*	***Students will be able to:***
	▪ Ask questions … to research the changes in the Sun's position in the sky using appropriate grade level print material. RI.3.10, W.3.7 ▪ Plan and carry out an Investigation … to observe and record the **changes in shadows over the course of the day**. **(Stability and change)** MP.5, MP.6 ▪ Construct an explanation … for the causes of **changes in the shapes of shadows over time**. **(Patterns)** MP.2 ▪ Engage in argument from evidence … about the causes of changes in the shapes of shadows over time. SL.3.1, SL.3.3, SL.3.4 ▪ Use mathematics … to **measure shadow lengths and measure time intervals**. **(Scale, proportion and quantity)** MP.5, MP.6 ▪ Analyze and interpret … shadow data to verify predictions about the Sun's movement across the sky during the day. MP.7

Sample Student	*Students will be able to:*
	▪ Ask questions ... to research the Moon's phases using appropriate grade level print material. RI.3.10, W.3.7 ▪ Develop a model … to show the **changes in the Moon's shape over the course of about four weeks**; update model as additional information is obtained. **(Patterns)** MP.7 ▪ Plan and carry out … investigations about the changes in the visible shape of the moon in the night sky over time. ▪ Analyze observations … in writing about the changes in the Moon's shape over the course of about four weeks using accurate vocabulary. W.3.2 ▪ Communicate … information orally and in writing about observations of the **changes in the shape of the moon over time**. **(Stability and change)** W.3.2, SL.3.5 ▪ Ask questions ... to research and discuss the changes in positions of constellations in the night sky using appropriate grade level print material. RI.3.10, W.3.7 ▪ Develop a model … to show the **positions of constellations with respect to the Sun and Earth**. **(Systems and system models)** MP.4 ▪ Ask questions … to research the development and use of the telescope and how this tool changed our ideas about the universe using accurate grade level print material. + RI.3.10, W.3.7
	* *All student outcome statements connect Science and Engineering Practices with the appropriate science content (and practices are underlined). In some student outcome statements, representative Crosscutting Concepts (and reference words) are bolded.* + *Indicates an engineering statement*

Key Ideas	
	▪ Day and night happen at different places on the surface of Earth when they face toward or away from the Sun as Earth **rotates** on its **axis** every 24 hours. (ESS1.B) ▪ From Earth, the **Sun** appears to rise in the east and set in the west because of its **rotation**. (ESS1.B) ▪ The Sun's position in the sky affects the size and shape of **shadows**. (ESS1.B) ▪ Because of the Sun's brightness its path in the sky is visible from Earth and changes with **seasons**. (ESS1.A, ESS1.B) ▪ Earth is one of several **planets** that orbit (**revolve** around) the Sun. (ESS1.B) ▪ The **Moon** orbits Earth (**satellite**) and looks a little different each night in the sky, but looks the same again about every four weeks (**lunar cycle**). (ESS1.B) ▪ The Moon's appearance, or **phase cycle**, as is visible from Earth, changes based on the portion that is **illuminated** by the Sun at that time (**moon phase**). (ESS1.B) ▪ The Moon changes its position in the sky during the day or night as it **orbits** Earth. (ESS1.B) ▪ Light from the Sun and other **stars** travels through space to Earth. (ESS1.A, PS4.B) ▪ The Sun is our closest star. (ESS1.A) ▪ A large light source at a distance looks like a small light source that is much closer. (ESS1.A) ▪ Stars are like the Sun, some being smaller and some larger, but so far away that they look like points of light. (ESS1.A) ▪ Stars have different sizes and brightness. (ESS1.A, ESS1.B) ▪ Stars form patterns, called **constellations**, best visible at night, that change position and/or visibility as the seasons change on Earth. (ESS1.A, ESS1.B) ▪ **Constellations** appear to move across the night sky as a result of the **rotation** of Earth. (ESS1.B) ▪ **Telescopes** are **instruments** that use lenses to bend light beams and magnify distant objects to make it easier for people to see more objects in the sky and far away objects in the sky better. (PS4.B, PS4.C, ETS2.A, ETS2.B) ▪ Scientists back up their **claims** with **evidence** that can be confirmed. (ETS1.A)

	▪ The results of the same **scientific investigations** are seldom exactly the same, but if the differences are great, it is important to try to figure out why. (ETS1.B, ETS1.C) ▪ Scientists communicate to inform others about their work, open their work up to **constructive criticism** of peers, and to help each other stay informed about scientific discoveries in the world. (ETS1.C) Additional academic vocabulary: **cycle, reflect, magnify, astronomer** *Key ideas track to Component Ideas (of Disciplinary Core Ideas) (e.g., PS1.A), drawn from* A Framework for K-12 Science Education. *Key terms are bolded above. They should be deeply understood within the context of their use. Not to be considered for standalone vocabulary exercises.* Resource: AAAS document

Prior Knowledge	▪ Patterns in the motion of the Moon can be observed, described, and predicted. ▪ The shape of the Moon looks a little different each night in the sky. ▪ The motion of the Sun across the sky follows a cyclical pattern. ▪ The Sun is visible during the day, but the Moon can sometimes be seen at night and during the day. ▪ Magnifiers help us see things we can't see without them. ▪ Scientists use magnifiers to help them see things they couldn't see without them. ▪ Scientists learn about things by observing them over time and keeping a record of their observations. ▪ Scientists use journals to record their observations accurately in writing or with drawings. ▪ Scientists discuss strengths and weaknesses in their designs. ▪ Scientists sometimes learn about things around them by doing something to the things and observing what happens ▪ Scientists compare their observations with observations of others.

Possible Misconceptions	▪ Some students may believe that the Sun is not a star. ▪ Students may be confused about how the Moon's phases occur. ▪ There may be some confusion about Earth orbiting the Sun. ▪ The relative size of the solar system and the planets may be misunderstood.

Possible Summative Assessment	▪ Develop a model to show the positions of the Sun, Earth, Moon and constellations and explain, using the model, how movement affects what we see.

Unit 5: Cycles of Living Things

From *A Framework for K-12 Science Education*	Science and Engineering Practices	Disciplinary Core Ideas ▪ Component Ideas	Crosscutting Concepts
	1. Asking questions (for science) and defining problems (for engineering) 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations (for science) and designing solutions (for engineering) 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	LS1: From Molecules to Organisms: Structures and Processes ▪ LS1.A: Structure and Function ▪ LS1.B: Growth and Development of Organisms ▪ LS1.C: Organization for Matter and Energy Flow in Organisms ▪ LS1.D: Information Processing LS2: Ecosystems, Interactions, Energy, and Dynamics ▪ LS2.A: Interdependent Relationships in Ecosystems ▪ LS2.C: Ecosystem Dynamics, Functioning, and Resilience LS3: Heredity: Inheritance and Variation of Traits ▪ LS3.A: Inheritance of Traits ▪ LS3.B: Variation of Traits LS4: Biological Evolution: Unity and Diversity ▪ LS4.C: Adaptation ▪ LS4.D: Biodiversity and Humans ETS1: Engineering Design ▪ ETS1.A: Defining and Delimiting an Engineering Problem ▪ ETS1.B: Develop Possible Solutions ▪ ETS1.C: Optimizing the Design Solution	1. **Patterns** 2. **Cause and effect: Mechanism and explanation** 3. Scale, proportion, and quantity 4. Systems and system models 5. **Energy and matter: Flows, cycles, and conservation** 6. **Structure and function** 7. Stability and change

IL State Learning Standards	Content	Skills
	12.A Know and apply concepts that explain how living things function, adapt, and change. 12.A.2a Describe simple life cycles of plants and animals and the similarities and differences in their offspring. 12.B Know and apply concepts that describe how living things interact with each other and with their environment. 12.B.2a Describe relationships among various organisms in their environments. 12.B.2b Identify physical features of plants and animals that help them live in different environments.	11.A Know and apply the concepts, principles, and processes of scientific inquiry. 11.B Know and apply the concepts, principles, and processes of technological design. 13.A Know and apply accepted practices of science. 13.B Know and apply concepts that describe the interaction between science, technology, and society.

Sample Student Outcome Statements*	*Students will be able to:*
	▪ Ask questions ... to research and discuss the **properties of the seeds of and the life cycles of different plants** using appropriate grade level print material. **(Patterns)** RI.3.10, W.3.7 ▪ Plan and carry out an investigation … to observe and test the **germination and sprouting time for different seeds**. **(Energy and matter: Flows, cycles, and conservation)** ▪ Obtain and communicate ... observations and **data about the germination time for different seeds** orally and in writing. **(Patterns)** W.3.4, SL.3.1, SL.3.6 ▪ Engage in argument from evidence … about seed germination times. SL.3.1, SL.3.3, SL.3.4 ▪ Design a model … to indicate the differences in growth rate of plants grown in soil and grown hydroponically labeling all parts, indicating rates, and explaining what happens. ▪ Plan, design, and construct ... a structure in which seeds can grow to plants hydroponically. + ▪ Plan and carry out an investigation … to test the **growth rate of plants grown in soil compared to plants grown hydroponically. (Cause and effect: Mechanism and explanation)**. + ▪ Communicate and evaluate … the design of the structure to grow plants hydroponically with others, comparing strengths and weaknesses to select the optimal design orally and in writing with peers. + W.3.2, SL.3.1, SL.3.6 ▪ Use mathematics … to measure rate of sprouting for plants over time. MP.1, MP.5 ▪ Ask questions ... to research and discuss the structures of selected organisms using appropriate grade level print material. RI.3.10, W.3.7 ▪ Plan and carry out … investigations about the basic needs and identified behaviors of selected organisms. ▪ Plan and carry out ... Investigations to observe the **functions of structures of selected organisms**. **(Structure and function)** ▪ Analyze observations ... in writing about the functions of structures of selected organisms using accurate vocabulary. W.3.2, L.3.6 * *All student outcome statements connect Science and Engineering Practices with the appropriate science content (and practices are underlined). In some student outcome statements, representative Crosscutting Concepts (and reference words) are bolded.* + *Indicates an engineering statement*

Key Ideas	
	▪ **Seeds** are **dormant** living organisms with observable **properties** and **structures**. (LS1.A) ▪ A **seed** contains a plant **embryo** and stores food and water. (LS1.A, LS1.B, LS1.C) ▪ Plants have basic needs such as water, light, and nutrients to survive. (LS1.B, LS1.C, LS2.A) ▪ Plants acquire their basic needs chiefly from air and water. (LS1.B, LS1.C, LS2.A) ▪ Plants and animals have diverse **life cycles**. (LS1.B) ▪ The stages of growth of a plant from **seed** to **seed-producing plant** is called a **life cycle**. (LS1.B) ▪ Living organisms have observable **external structures** and characteristic behaviors that help them grow and **survive** in various **environments**. (LS1.A) ▪ Organisms may look more or less like their parents as a result of a mix of **traits inherited** from their **biological parents**. (LS3.A, LS3.B) ▪ Various organisms have common structures, but there are also differences between the structures of various organisms. (LS1.A, LS3.A, LS3.B) ▪ There are structures of an organism, called **sense receptors** that support its survival by helping it obtain its basic needs such as air, water, and food, and supporting its life in its **habitat**. (LS1.A, LS1.D) ▪ Living organisms live best in habitats suitable to their needs. (LS2.A,LS2.C, LS4.C) ▪ Some organisms survive well, less well, or do not survive in particular environments. (LS2.A, LS4.C)

	▪ Changes in environments affect organisms living there. (LS2.A, LS2.C, LS4.D) ▪ The food of most animals can be traced back to plants, which makes them **consumers**. (LS1.C) ▪ Organisms **inherit** many characteristics from their parents, but some are the result of **interactions** with the environment. (LS3.A, LS3.B) ▪ Scientists back up their **claims** with **evidence** that can be confirmed. (ETS1.A) ▪ The results of the same **scientific investigations** are seldom exactly the same, but if the differences are great, scientists try to figure out why. (ETS1.B, ETS1.C) ▪ Scientists communicate to inform others about their work, open their work up to **constructive criticism** of peers, and to help each other stay informed about scientific discoveries in the world. (ETS1.C) Additional academic vocabulary: **fruit, flower, germination, function**
	Key ideas track to Component Ideas (of Disciplinary Core Ideas) (e.g., PS1.A), drawn from A Framework for K-12 Science Education. *Key terms are bolded above. They should be deeply understood within the context of their use. Not to be considered for standalone vocabulary exercises.* Resource: AAAS document

Prior Knowledge	▪ Living things can be found in many different places in the world around us. ▪ All living things, including humans, have basic needs that include food, water, air, and space. ▪ Organisms, including humans, have identifiable basic structures and characteristic behaviors that help them grow and survive. ▪ Organisms have special body parts that help convey different information for survival. ▪ Living things, including plants and seeds, are similar in some ways and different in other ways. ▪ Seeds and plants grow, change, and die over time. ▪ Plants often depend on animals to move their seeds around. ▪ Organisms usually live in places that meet their needs on land or in water. ▪ Different plants survive better in different environments because of the differences in basic needs. ▪ An environment may not meet the needs of a particular organism, so it cannot live there. ▪ Differences occur within one species of an organism. ▪ Organisms respond to changes around them. ▪ Environmental conditions influence the behavior of organisms. ▪ Scientists use magnifiers to help them see things they couldn't see without them so they can observe organisms. ▪ Scientists learn about the behaviors of live organisms and their habitats by observing them over time and recording their observations. ▪ Scientists use journals to record their observations accurately in writing or with drawings. ▪ Scientists discuss strengths and weaknesses in their designs. ▪ Scientists sometimes learn about things around them by doing something to the things and observing what happens. ▪ Scientists compare their observations with observations of others.

Possible Misconceptions	▪ Some students may believe that plants can only grow in soil. ▪ Students may confuse the taxonomical grouping of different organisms. ▪ Some students may not believe that seeds are living.

Possible Summative Assessment	Construct a model of an imaginary plant/organism, describing its observable structures and indicating how each supports the plant's/organism's survival.

Grade 3 Science Connections Common Core State Standards for Literacy and Standards for Mathematical Practice (CCSS-L and CCSS-M)

CCSS Connections	CCSS-L
	▪ RI.3.1 Ask and answer such questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. ▪ RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. () ▪ RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in a technical procedure in a text, using language that pertains to time, sequence, and cause/effect. ▪ RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area. ▪ RI.3.5 Use text features and search tools to locate information relevant to a given topic efficiently. ▪ RI.3.6 Distinguish their own point of view from that of the author of a text. ▪ RI.3.7 Use information gained from illustrations and the words in a text to demonstrate understanding of the text. ▪ RI.3.8 Describe the logical connection between particular sentences and paragraphs in a text. ▪ RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic. ▪ RI.3.10 By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 2-3 text complexity band independently and proficiently. ▪ W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. ▪ W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. ▪ W.3.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences. ▪ W.3.4 With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. ▪ W.3.5 With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing. ▪ W.3.6 With guidance and support from adults, use technology to produce and publish writing as well as to interact and collaborate with others. ▪ W.3.7 Conduct short research projects that build knowledge about a topic. ▪ W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. ▪ (W.9 Begins in grade 4: W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.) ▪ W.3.10 Write routinely over extended time frames and shorter time frames for a range of discipline-specific tasks, purposes, and audiences. ▪ SL.3.1 Engage effectively in a range of collaborative discussions with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly. ▪ SL.3.2 Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally. ▪ SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. ▪ SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. ▪ SL.3.5 Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. ▪ SL.3.6 Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

CCSS	CCSS-L
	▪ L.3.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. ▪ L.3.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. ▪ L.3.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening. ▪ L.3.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies. ▪ L.3.5 Demonstrate understanding of word relationships and nuances in word meanings. ▪ L.3.6 Acquire and use accurately grade-appropriate conversational, general academic and domain-specific words and phrases, including those that signal spatial and temporal relationships.
	CCSS-M (Standards for Mathematical Practice)
	▪ MP.1 Make sense of problems and persevere in solving them. ▪ MP.2 Reason abstractly and quantitatively. ▪ MP.3 Construct viable arguments and critique the reasoning of others. ▪ MP.4 Model with mathematics. ▪ MP.5 Use appropriate tools strategically. ▪ MP.6 Attend to precision. ▪ MP.7 Look for and make use of structure. ▪ MP.8 Look for and express regularity in repeated reasoning.