About the *Rhode Island K-12 Grade Span Expectations in Science*

The document, the *Rhode Island K-12 Grade Span Expectations in Science*, has been developed as a means to identify the science concepts and skills expected of all students. The RI science GSEs encompass the content eligible for inclusion on the large-scale assessment of science in grades 4, 8, and 11. They are not intended to represent the full science curriculum at each grade span, but are meant to capture the "major ideas" of science that can be assessed in an on-demand setting. The goal is that the science GSEs focus the curriculum, but do not restrict it.

The science GSEs are written for grade spans K-2, 3-4, 5-6, 7-8, and high school. They describe the science knowledge and abilities students should demonstrate at the end of each grade span. Since the large-scale high school science assessment is given near the end of grade 11, the GSEs for high school for all students are aligned with the content for the assessment. GSEs labeled "**Example Extensions"** are more challenging and provide direction for in-depth study of a particular topic in a course, class or individual student project. The RI science GSEs are extracted from the assessment targets developed as part of the framework for the common science assessment conducted in New Hampshire, Vermont and Rhode Island.

As you review the *Rhode Island K-12 Grade Span Expectations in Science*, the following information is important to understand, particularly the relationship between the science GSEs and the science assessment targets.

The science GSEs are organized into three **domains; Life Science, Earth and Space Science; and Physical Science.**

1. The three domains are further subdivided into ten **Statements of Enduring Knowledge** (EK) (listed in Table 1) that
    a. are intended to identify the fundamental knowledge/concepts for each domain of science.
    b. cut across grade levels, so that learning is developmental/built upon across grades (although not all aspects of the EK may be addressed at all grade levels)
    c. are of comparable grain size
    d. encompass, as a set, the *essential learning for each domain of science*
    e. imply topics of study (and therefore, lead to focused instruction, as identified in science standards/benchmarks/GSEs)

2. Each **Assessment Target** is linked to one Statement of Enduring Knowledge, as indicated with the target's coding (e.g., LS1 means Life Science and the first EK statement, LS2 means Life Science and the second EK, etc.)

3. Each Assessment Target incorporates one or more **Unifying Themes**, the broader universal principles that integrate the different scientific disciplines. Six Unifying Themes of Science were chosen after an extensive review of the literature and are further described in Table 2.

4. Assessment Targets for high school, middle school, and elementary school were developed by applying the Unifying Themes of science to the Statements of Enduring Knowledge for each of the science domains of Life Science, Earth and Space Science, and Physical Science. **Not every Unifying Theme has an "intersection" with every** Statement of Enduring Knowledge. Development committees used prioritization strategies and field reviews to determine which assessment targets would provide the richest opportunities for large-scale assessment purposes.

TABLE 1 **Statements of Enduring Knowledge (EK) by Domain**	
Life Science	**LS 1** All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, and species).
	LS 2 Matter cycles and energy flows through an ecosystem.
	LS 3 Groups of organisms show evidence of change over time (structures, behaviors, and biochemistry).
	LS 4 Humans are similar to other species in many ways, and yet are unique among Earth's life forms.
Earth & Space Science	**ESS 1** The Earth and earth materials as we know them today have developed over long periods of time, through continual change processes.
	ESS 2 The earth is part of a solar system, made up of distinct parts that have temporal and spatial interrelationships.
	ESS 3 The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time
Physical Science	**PS 1** All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another *(independent of size or amount of substance)*
	PS 2 Energy is necessary for change to occur in matter. Energy can be stored, transferred and transformed, but cannot be destroyed.
	PS 3 The motion of an object is affected by forces.

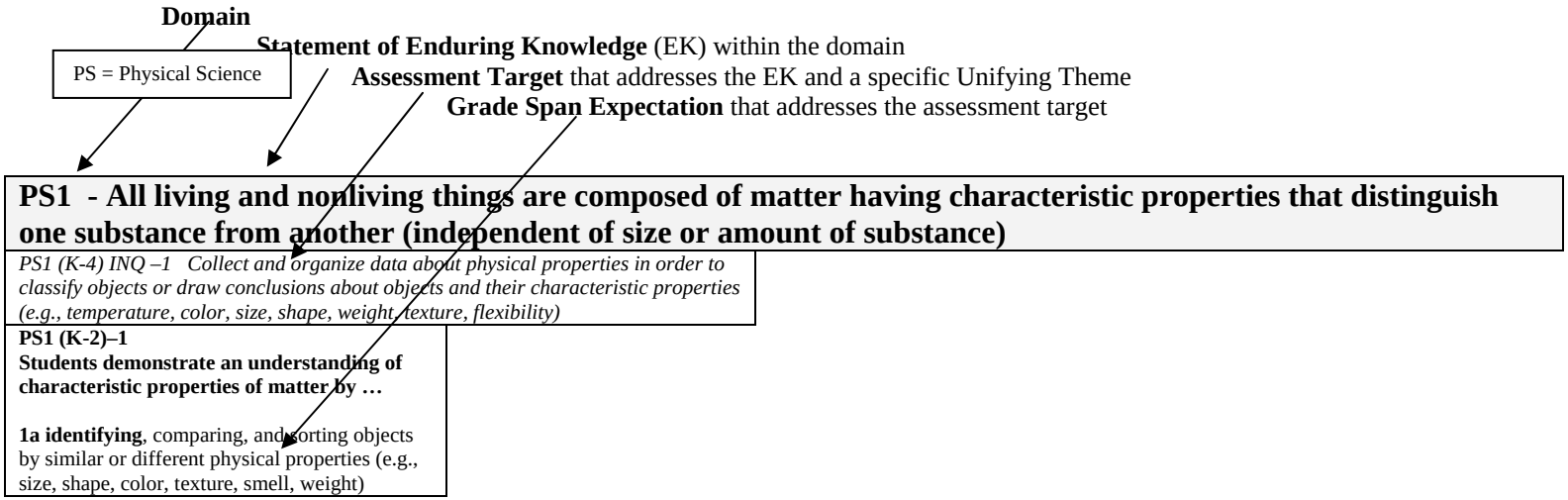
TABLE 2

Unifying Themes of Science

(Subheadings under each Unifying Theme/Big Idea suggest but are not limited to what might be addressed)

Scientific Inquiry	Nature of Science	Systems & Energy	Models & Scale	Patterns of Change	Form & Function
• Collect data • Communicate understanding & ideas • Design, conduct, & critique investigations • Represent, analyze, & interpret data • Experimental design • Observe • Predict • Question and hypothesize • Use evidence to draw conclusions • Use tools, & techniques	• Accumulation of science knowledge (evidence & reasoning, looking at work of others) • Attitudes and dispositions of science (avoiding bias, divergent ideas, healthy skepticism) • History of Science • Science/Tech/ Society • Scientific Theories	• Cycles • Energy Transfer • Equilibrium • Interactions • Interdependence • Order & Organization	• Evidence provided through… • Explanations provided through… • Relative distance • Relative sizes *Models include - experimental models, simulations, & representations used to demonstrate abstract ideas*	• Constancy and Change • Cycles • Evolutionary Change	• Natural World

5. The *Rhode Island K-12 Grade Span Expectations in Science* are sequenced in the following manner:



6. Each Assessment Target contains a code before the narrative text of the target. These codes identify the specific Statement of Enduring Knowledge, the grade span, the connections to one or more Unifying Theme/Big Idea, and finally the target number.
Table 3 illustrates an example: **LS1 (K-4) INQ+POC –1** means that this target addresses the first Life Science EK statement (**LS1**); the (**K-4**) grade span; is linked to Unifying Themes/Big ideas of Inquiry (**INQ**) and Patterns of Change (**POC**); and is the first assessment target listed (**1**) under the domain of Life Science. Some targets address only one Unifying Theme and others address more than one. For a more detailed explanation see ***READING A SCIENCE GSE*** found on page 6 of this document.

Table 3 Sample Target Coding

LS1 – All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, and species)

Elementary Target	Middle School Target	High School Target
LS1 (K-**4) INQ+POC –1** Sort/classify different living things using similar and different characteristics. Describe why organisms belong to each group or cite evidence about how they are alike or not alike.	LS1 (5-**8**) – INQ+ SAE- **1** Using data and observations about the biodiversity of an ecosystem make predictions or draw conclusions about how the diversity contributes to the stability of the ecosystem.	LS1 (9-**11**) INQ+SAE+FAF -**1** Use data and observation to make connections between, to explain, or to justify how specific cell organelles produce/regulate what the cell needs or what a unicellular or multi-cellular organism needs for survival (e.g., protein synthesis, DNA replication, nerve cells)

7. Assessment Target numbering is consecutive within each domain of science for each grade span. For example, at grades K-4, Life Science targets are numbered 1 though 9 (beginning with LS1, then continuing with LS2, LS3, and LS4); Physical Science targets begin the numbering again with 1 through 8 for PS1, PS2 and PS3; and Earth/Space Science targets again begin numbering 1 through 6

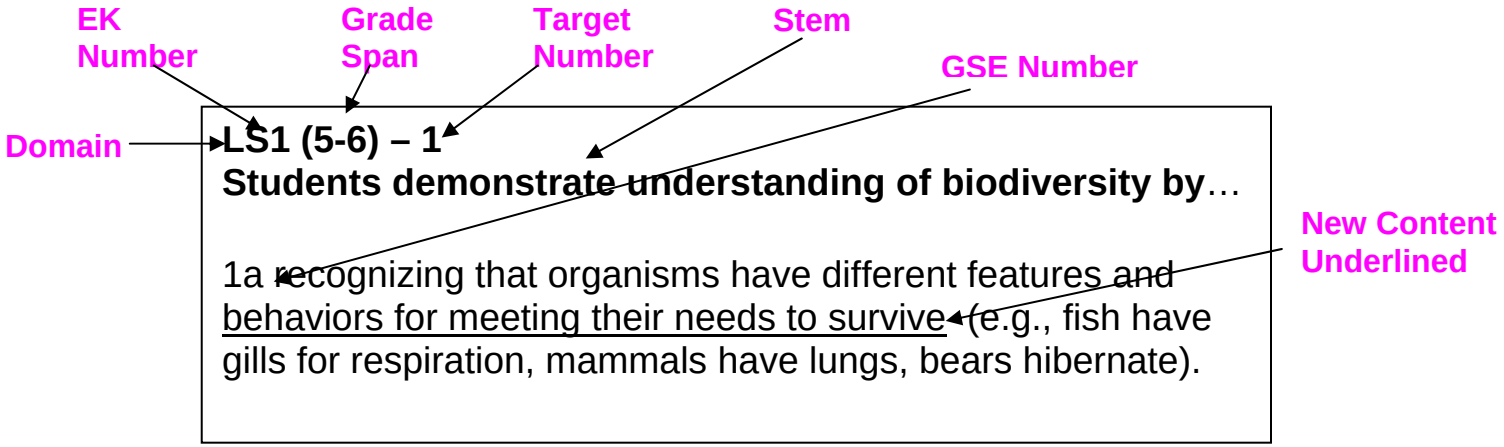
8. While the Statements of Enduring Knowledge are the same across all grade spans, the set of related targets within a grade span *do not address all aspects of the EK Statement.* This was done intentionally to focus instruction and assessment on the essential learning for the grade span, as well as on the developmentally appropriate concepts and skills. For example, at the elementary grade span, LS1 will focus on organisms and external structures, while the middle school grade span will move to internal structures and include organisms and population

The Tri-State Science Assessment Targets are…

- derived from and aligned with national and NH, RI, and VT's state science standards
- developed at the "intersections" by applying the Unifying Themes to the Statements of Enduring Knowledge [e.g., What "Systems & Energy" concepts are essential to understanding LS1: All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, and species)?]
- constructed with the understanding that not every Unifying Theme will have a meaningful "intersection" with every Statement of Enduring Knowledge
- designed to be general/broad enough to allow for multiple potential test items or assessment tasks with varying cognitive demands (Depth of Knowledge Levels)
- written, for the most part, with an intended cognitive demand ceiling consistent with Depth of Knowledge (DOK) Levels 2 (Skills & Concepts) or 3 (Strategic Thinking) – based on the work of Norman L. Webb

READING A SCIENCE GSE

Statement of Enduring Knowledge	Target
LS1 ***All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, and species).***	**LS1 (5-8) – INQ + SAE- 1 Using data and observations about the biodiversity of an ecosystem make predictions or draw conclusions about how the diversity contributes to the stability of the ecosystem.**



ESS1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.					
ESS1 (K-4) INQ –1 *Given certain earth materials (soils, rocks or minerals) use physical properties to sort, classify, and describe them.*		***ESS1 (5-8) INQ+ POC –1*** *Use geological evidence provided to support the idea that the Earth's crust/lithosphere is composed of plates that move.*		***ESS1 (9-11) INQ+POC– 1*** *Provided with geologic data (including movement of plates) on a given locale, predict the likelihood for an earth event (e.g., volcanoes, mountain ranges, islands, earthquakes).*	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		**Grade Span Expectations (HS)**	
ESS1 (K-2)–1 **Students demonstrate an understanding of earth materials by …** **1a** describing, comparing, and sorting rocks and soils by similar or different physical properties (e.g., size, shape, color, texture, smell, weight). **1b** recording observations/data about physical properties. **1c** using attributes of properties to state why objects are grouped together (e.g., rocks that are shiny or not shiny).	**ESS1 (3-4) –1** **Students demonstrate an understanding of earth materials by …** **1a** describing, comparing, and sorting rocks, soils, and minerals by similar or different physical properties (e.g., size, shape, color, texture, smell, weight, temperature, hardness, composition). **1b** recording and analyzing observations/data about physical properties (e.g., within a grouping, which characteristics are the same and which are different). **1c** citing evidence (e.g., prior knowledge, data) to support why rocks, soils, or minerals are classified/not classified together. **1d** identifying the four basic materials of the earth (water, soil, rocks, air).	**ESS1 (5-6)–1** **Students demonstrate an understanding of processes and change over time within earth systems by …** **1a** identifying and describing the layers of the earth. **1b** plotting location of volcanoes and earthquakes and explaining the relationship between the location of these phenomena and faults.	**ESS1 (7-8)–1** **Students demonstrate an understanding of processes and change over time within earth systems by …** **1a** citing evidence and developing a logical argument for plate movement using fossil evidence, layers of sedimentary rock, location of mineral deposits, and shape of the continents.	**ESS1 (9-11)– 1** **Students demonstrate an understanding of processes and change over time within earth systems by …** **1a.** plotting the location of mountain ranges and recent earthquakes and volcanic eruptions to identify any existing patterns.	**Example Extension(s)**

ESS1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.					
ESS1 (K-4) INQ –2 *Use results from an experiment to draw conclusions about how water interacts with earth materials (e.g., percolation, erosion, frost heaves*).		***ESS1 (5-8) SAE–2*** *Explain the processes that cause the cycling of water into and out of the atmosphere and their connections to our planet's weather patterns.*		***ESS1 (9-11) NOS–2*** *Trace the development of the theory of plate tectonics or provide supporting geologic/geographic evidence that supports the validity of the theory of plate tectonics.*	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		**Grade Span Expectations (HS)**	
ESS1 (K-2) –2 **Students demonstrate an understanding of processes and change over time within earth systems by …** **2a** conducting tests on how different soils retain water (e.g., how fast does the water drain through?).	**ESS1 (3-4)–2** **Students demonstrate an understanding of processes and change over time within earth systems by …** **2a** conducting investigations and using observational data to describe how water moves rocks and soils.	**ESS1 (5-6)–2** **Students demonstrate an understanding of processes and change over time within earth systems by …** **2a** diagramming, labeling and explaining the processes of the water cycle including evaporation, precipitation, and run-off, condensation, transpiration, and groundwater. **2b** explaining how condensation of water vapor forms clouds which affects climate and weather. **2c** developing models to explain how humidity, temperature, and altitude affect air pressure and how this affects local weather. **2d** identifying composition and layers of earth's atmosphere.	**ESS1 (7-8)–2** **Students demonstrate an understanding of processes and change over time within earth systems by …** **No GSEs for the ESS1 (5-8) SAE-2 Assessment Target**	**ESS1 (9-11)–2** **Students demonstrate an understanding of processes and change over time within earth systems by …** **2a** using given data (diagrams, charts, narratives, etc.) and advances in technology to explain how scientific knowledge regarding plate tectonics has changed over time.	**Example Extension(s)**

ESS1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.					
ESS 1 (K-4) NOS –3 *Explain how the use of scientific tools helps to extend senses and gather data about weather. (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).*		***ESS1 (5-8) POC –3*** *Explain how earth events (abruptly and over time) can bring about changes in Earth's surface: landforms, ocean floor, rock features, or climate.*		***ESS1 (9-11) SAE+ POC–3*** *Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle, plate tectonics, sea floor spreading).*	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		**Grade Span Expectations (HS)**	
ESS 1(K-2)–3 **Students demonstrate an understanding of how the use of scientific tools helps to extend senses and gather data by…** **3a** using scientific tools to extend senses and gather data about weather (e.g., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).	**ESS 1(3-4) –3** **Students demonstrate an understanding of how the use of scientific tools helps to extend senses and gather data by…** **3a** explaining how the use of scientific tools helps to extend senses and gather data about weather (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches). **3b** selecting appropriate tools for a given task and describing the information they will provide.	**ESS1 (5-6)–3** **Students demonstrate an understanding of processes and change over time within earth systems by …** **3a** describing events and the effect they may have on climate (e.g. El Nino, deforestation, glacial melting, and an increase in greenhouse gases).	**ESS1 (7-8)–3** **Students demonstrate an understanding of processes and change over time within earth systems by …** **3a** evaluating slow processes (e.g. weathering, erosion, mountain building, sea floor spreading) to determine how the earth has changed and will continue to change over time. **3b** evaluating fast processes (e.g. erosion, volcanoes and earthquakes) to determine how the earth has changed and will continue to change over time. **3c** investigating the effect of flowing water on landforms (e.g. stream table, local environment).	**ESS1 (9-11)–3** **Students demonstrate an understanding of processes and change over time within earth systems by …** **3a** explaining how heat (produced by friction, radioactive decay and pressure) affects the Rock Cycle. **3b** explaining how convection circulations of the mantle initiate the movement of the crustal plates which then cause plate movement and seismic activity. **3c** investigating and using evidence to explain that conservation in the amount of earth materials occurs during the Rock Cycle. **3d** explaining how the physical and chemical processes of the Earth alter the crust (e.g. seafloor spreading, hydrologic cycle, weathering, element cycling).	**Example Extension(s)** **ESS1 (Ext.)–3** **Students demonstrate an understanding of processes and change over time within earth systems by** **3aa** describe how interaction of wind patterns, ocean currents, and mountain ranges results in the global pattern of latitudinal bands of rain forests and deserts. **3bb** use computer modeling/ simulations to predict the effects of an increase in greenhouse gases on earth systems (e.g. earth temperature, sea level, atmosphere composition).

ESS1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.					
ESS1 (K-4) INQ+SAE –4 *Explain how wind, water, or ice shape and reshape the earth.*		***ESS1 (5-8) SAE+ POC –4*** *Explain the role of differential heating or convection in ocean currents, winds, weather and weather patterns, atmosphere, or climate.*		***ESS1 (9-11) INQ+POC+ MAS—4*** *Relate how geologic time is determined using various dating methods (e.g. radioactive decay, rock sequences, fossil records).*	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		**Grade Span Expectations (HS)**	
ESS1 (K-2) –4 **Students demonstrate an understanding of processes and change over time within earth systems by …** **4a** observing and recording seasonal and weather changes throughout the school year.	**ESS1 (3-4) –4** **Students demonstrate an understanding of processes and change over time within earth systems by …** **4a** investigating local landforms and how wind, water, or ice have shaped and reshaped them (e.g. severe weather). **4b** using or building models to simulate the effects of how wind and water shape and reshape the land (e.g., erosion, sedimentation, deposition, glaciation). **4c** identifying sudden and gradual changes that affect the Earth (e.g. sudden change = flood; gradual change = erosion caused by oceans).	**ESS1 (5-6)–4** **Students demonstrate an understanding of processes and change over time within earth systems by …** **4a** explaining how differential heating and convection affect Earth's weather patterns. **4b** describing how differential heating of the oceans affects ocean currents which in turn influence weather and climate. **4c** explaining the relationship between differential heating/convection and the production of winds. **4d** analyzing global patterns of atmospheric movements to explain effects on weather. **4e** predicting temperature and precipitation changes associated with the passing of various fronts.	**ESS1 (7-8)–4** **Students demonstrate an understanding of processes and change over time within earth systems by …** **No GSEs for the ESS1 (5-8) SAE+POC=4 Assessment Target** **4a** explaining cause and effect relationships between global climate and energy transfer. **4b** using evidence to make inferences or predictions about global climate issues.	**ESS1 (9-11)—4** **Students demonstrate an understanding of processes and change over time by …** **4a** describing various dating methods to determine the age of different rock structures.	**Example Extension(s)** **Students demonstrate an understanding of processes and change over time by …** **4aa** calculating the age of a rocks from various regions using radioactive half life (given its constituent elements, isotopes and rate of decay) and using those values to provide evidence for geologic relationships between/among the regions. **4bb** analyzing samples of rock to determine the relative age of the rock structure.

ESS 1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.

ESS1 (K-4) POC –5 *Based on data collected from daily weather observations, describe weather changes or weather patterns.*		***ESS1 (5-8) INQ+ POC –5*** *Using data about a rock's physical characteristics make and support an inference about the rock's history and connection to rock cycle.*		**No further targets for EK ESS1 at the High School Grade Span**	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		**Grade Span Expectations (HS)**	
ESS1 (K-2) –5 **Students demonstrate an understanding of processes and change over time within earth systems by …** **5a** observing, recording, and summarizing local weather data. **5b** observe how clouds are related to forms of precipitation (e.g., rain, sleet, snow).	**ESS1 (3-4) –5** **Students demonstrate an understanding of processes and change over time within earth systems by …** **5a** observing, recording, comparing, and analyzing weather data to describe weather changes or weather patterns. **5b** describing water as it changes into vapor in the air and reappears as a liquid when it's cooled. **5c** explaining how this cycle of water relates to weather and the formation of clouds.	**ESS1 (5-6)-5** **Students demonstrate an understanding of processes and change over time by …** **5a** representing the processes of the rock cycle in words, diagrams, or models. **5b** citing evidence and developing a logical argument to explain the formation of a rock, given its characteristics and location. (e.g. classifying rock type using identification resources).	**ESS1 (7-8)-5** **Students demonstrate an understanding of processes and change over time by …** **No GSEs for the ESS1 (5-8) INQ+POC-5 Assessment Target**		
ESS1 (K-4) FAF -6 *Given information about earth materials explain how their characteristics lend themselves to specific uses*		**No further targets for EK ESS1 at the 5-8 Grade Span**			
ESS1 (K-2) –6 **Students demonstrate an understanding of properties of earth materials by…** **6a** identifying which materials are best for different uses (e.g., soils for growing plants, sand for the sand box).	**ESS1 (3-4)-6** **Students demonstrate an understanding of properties of earth materials by…** **6a** determining and supporting explanations of their uses (e.g., best soils to grow plants, best building material for a specific purpose, determining which rock size will best prevent erosion).				

<table>
<tr><th colspan="5">ESS2 - The earth is part of a solar system, made up of distinct parts that have temporal and spatial interrelationships.</th></tr>
<tr><td colspan="2">No further targets for EK ESS2 at the K-4 Grade Span</td><td colspan="2">ESS2 (5-8) MAS –6
Compare and contrast planets based on data provided about size, composition, location, orbital movement, atmosphere, or surface features (includes moons).</td><td>No further targets for EK ESS2 at the High School Grade Span.</td></tr>
<tr><td colspan="2">Grade Span Expectations (K-4)</td><td colspan="2">Grade Span Expectations (5-8)</td><td>Grade Span Expectations (HS)</td></tr>
<tr><td>ESS2 (K-2) –7
Students demonstrate an understanding of temporal or positional relationships between or among the Earth, sun, and moon by …

7a observing that the sun can only be seen in the daytime, but the moon can be seen sometimes at night and sometimes during the day.

7b observing that the sun and moon appear to move slowly across the sky.

7c observing that the moon looks slightly different from day to day.</td><td>ESS2 (3-4)-7
Students demonstrate an understanding of temporal or positional relationships between or among the Earth, sun, and moon by …

7a observing that the sun, moon, and stars appear to move slowly across the sky.

7b observing that the moon looks slightly different from day to day, but looks the same again in about 4 weeks.

7c recognizing that the rotation of the Earth on its axis every 24 hours produces the day/night cycle.</td><td>ESS2 (5-6)-6
Students demonstrate an understanding of characteristics of the solar system by …

6a identifying and comparing the size, location, distances, and movement (e.g. orbit of planets, path of meteors) of the objects in our solar system.

6b comparing the composition, atmosphere, and surface features of objects in our solar system.</td><td>ESS2 (7-8) -6
Students demonstrate an understanding of characteristics of the solar system by …

No GSEs for the ESS2 (7-8)-6 Assessment Target</td><td></td><td></td></tr>
</table>

ESS2 - The earth is part of a solar system, made up of distinct parts that have temporal and spatial interrelationships.					
No further targets for EK ESS2 at the K-4 Grade Span		***ESS2 (5-8) NOS –7*** *Explain how technological advances have allowed scientists to re-evaluate or extend existing ideas about the solar system.*		**No further targets for EK ESS2 at the High School Grade Span.** *The GSE listed below is to be assessed at the local level only*	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		**Grade Span Expectations (HS)**	
ESS2 (K-2)-8 **Students demonstrate an understanding of characteristics of the solar system by …** **No GSEs for this Assessment Target**	**ESS2 (3-4)-8** **Students demonstrate an understanding of characteristics of the solar system by …** **8a** recognizing that: the sun is the center of our solar system; the Earth is one of several planets that orbits the sun; and the moon orbits the Earth. **8b** recognizing that it takes approximately 365 days for the Earth to orbit the sun.	**ESS2 (5-6)-7** *Students demonstrate an understanding of how technological advances have allowed scientists to re-evaluate or extend existing ideas about the solar system by…* **No GSEs for the ESS2 (5-8) NOS-7 Assessment Target**	**ESS2 (7-8) -7** *Students demonstrate an understanding of how technological advances have allowed scientists to re-evaluate or extend existing ideas about the solar system by…* **7a** identifying major discoveries from different scientists and cultures and describing how these discoveries have contributed to our understanding of the solar system (e.g. timeline, research project, picture book).		**Example Extension(s)** **ESS2 (Ext.) -X** **Students demonstrate an understanding of temporal or positional relationships between or among the Earth, sun, and moon and the stars by...** **Xaa** explaining their role in navigation, beginning with ancient civilizations, advancing through 19th century mathematical celestial navigation, to current Global Positioning Systems.

ESS2 - The earth is part of a solar system, made up of distinct parts that have temporal and spatial interrelationships.				
No further targets for EK ESS2 at the K-4 Grade Span	***ESS2 (5-8) SAE+ POC –8*** ***Explain temporal or positional relationships between or among the Earth, sun, and moon (e.g., night/day, seasons, year, tides) or how gravitational force affects objects in the solar system (e.g., moons, tides, orbits, satellites).***		**No further targets for EK ESS2 at the High School Grade Span.**	
Grade Span Expectations (K-4)	**Grade Span Expectations (5-8)**		**Grade Span Expectations (HS)**	
	ESS2 (5-6)-8 Students demonstrate an understanding of temporal or positional relationships between or among the Earth, sun, and moon by … **8a** using models to describe the relative motion/position of the Earth, sun and moon. **8b** explaining night/day, seasons, year, and tides as a result of the regular and predictable motion of the Earth, sun, and moon. **8c** using a model of the Earth, sun and moon to recreate the phases of the moon. **ESS2 (5-6) -8** **Students demonstrate an understanding of gravitational relationships between or among objects of the solar system by …** **8d** defining the Earth's gravity as a force that pulls any object on or near the Earth toward its center without touching it.	**ESS2 (7-8) -8** **Students demonstrate an understanding of temporal or positional relationships between or among the Earth, sun, and moon by …** **8a** using or creating a model of the Earth, sun and moon system to show rotation and revolution. **8b** explaining night/day, seasons, year, and tides as a result of the regular and predictable motion of the Earth, sun, and moon. **8c** using a model of the Earth, sun and moon to recreate the phases of the moon. **ESS2 (7-8) -8** **Students demonstrate an understanding of gravitational relationships between or among objects of the solar system by…** **8d** describing the relationship between mass and the gravitational force between objects. **8e** describing the relationship between distance and the gravitational force between objects. **8f** explaining that the sun's gravitational pull holds the Earth and other planets in their orbits, just as the planet's gravitational pull keeps their moons in orbit.		

ESS3 - The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time

No further targets for EK ESS3 at the K-4 Grade Span *The GSEs listed below are assessed at the local level only*		**No further targets for EK ESS3 at the 5-8 Grade Span** ***The GSEs listed below are assessed at the local level only***		***ESS3 (9-11) NOS–5*** *Explain how scientific theories about the structure of the universe have been advanced through the use of sophisticated technology (e.g., space probes; visual, radio and x-ray telescopes).*	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		**Grade Span Expectations (HS)**	
ESS3 (K-2) –9 **Students demonstrate understanding of processes and change over time within the system of the universe (Scale, Distances, Star Formation, Theories, Instrumentation) by…** **9a** observing that there are more stars in the sky than can easily be counted, but they are not scattered evenly and not all the same in brightness.	**ESS3 (3-4)-9** **Students demonstrate understanding of processes and change over time within the system of the universe (Scale, Distances, Star Formation, Theories, Instrumentation) by…** **9a** recognizing that throughout history people have identified patterns of stars that we call constellations.	**ESS3 (5-6)–9** **Students demonstrate an understanding of the structure of the universe by …** **9a** describing the apparent motion/position of the objects in the sky. (e.g. constellations, planets). **9b** identifying the sun as a medium-sized star located near the edge of a disk-shaped galaxy of stars.	**ESS3 (7-8)-9** **Students demonstrate an understanding of the structure of the universe by…** **9a** describing the universe as containing many billions of galaxies, and each galaxy contains many billions of stars.	**ESS3 (9-11)–5** **Students demonstrate an understanding of the origins and evolution of galaxies and the universe by…** **5a** using appropriate prompts (diagrams, charts, narratives, etc.) students will explain how scientific knowledge regarding the structure of the universe has changed over time due to advances in technology which accumulates new evidence to redefine scientific theories and ideas.	**Example Extension(s)** **ESS3 (Ext.)–5** **Students demonstrate an understanding of the origins and evolution of galaxies and the universe by…** **5aa comparing** the processes involved in the life cycle of stars (e.g. gravitational collapse, thermonuclear fusion, nova) and evaluate supporting evidence**.**

No further targets for EK ESS3 at the K-4 Grade Span		**No further targets for EK ESS3 at the 5-8 Grade Span**		***ESS3 (9-11) NOS–6*** *Provide scientific evidence that supports or refutes the "Big Bang" theory of how the universe was formed*	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		**Grade Span Expectations (HS)**	
				ESS3 (9-11)–6 **Students demonstrate an understanding of the formation of the universe by…** **6a** using data (diagrams, charts, narratives, etc.) to explain how the "Big Bang" theory has developed over time citing evidence to support its occurrence (Doppler Effect/red shift).	**Example Extension(s)**

ESS3 - The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time

No further targets for EK ESS3 at the K-4 Grade Span *The GSEs listed below are assessed at the local level only*		**No further targets for EK ESS3 at the 5-8 Grade Span** ***The GSEs listed below are assessed at the local level only***		***ESS3 (9-11) SAE -7*** ***Based on the nature of electromagnetic waves, explain the movement and location of objects in the universe or their composition (e.g., red shift, blue shift, line spectra)***	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		**Grade Span Expectations (HS)**	
ESS3 (K-2) –9 **Students demonstrate understanding of processes and change over time within the system of the universe (Scale, Distances, Star Formation, Theories, Instrumentation) by…** **9a** observing that there are more stars in the sky than can easily be counted, but they are not scattered evenly and not all the same in brightness.	**ESS3 (3-4)-9** **Students demonstrate understanding of processes and change over time within the system of the universe (Scale, Distances, Star Formation, Theories, Instrumentation) by…** **9a** recognizing that throughout history people have identified patterns of stars that we call constellations.	**ESS3 (5-6)–9** **Students demonstrate an understanding of the structure of the universe by …** **9a** describing the apparent motion/position of the objects in the sky. (e.g. constellations, planets). **9b** identifying the sun as a medium-sized star located near the edge of a disk-shaped galaxy of stars.	**ESS3 (7-8)-9** **Students demonstrate an understanding of the structure of the universe by…** **9a** describing the universe as containing many billions of galaxies, and each galaxy contains many billions of stars.	**ESS3 (9-11)–7** **Students demonstrate an understanding of processes and change over time within the system of the universe (Scale, Distances, Star Formation, Theories, Instrumentation) by...** **7a** applying the properties of waves/particles to explain the movement, location, and composition of the stars and other bodies in the universe.	

No further targets for EK ESS3 at the K-4 Grade Span		**No further targets for EK ESS3 at the 5-8 Grade Span**		***ESS3 (9-11) POC+SAE – 8*** *Explain the relationships between or among the energy produced from nuclear reactions, the origin of elements, and the life cycle of stars.*	
Grade Span Expectations (K-4)		**Grade Span Expectations (5-8)**		**Grade Span Expectations (HS)**	
				ESS3 (9-11)–8 **Students demonstrate an understanding of the life cycle of stars by …** **8a** relating the process of star formation to the size of the star and including the interaction of the force of gravity, fusion, and energy release in the development of the star identify ing and describing the characteristics common to most stars in the universe. **8b** Describing the ongoing	**Example Extension(s)**

		processes involved in star formation, their life cycles and their destruction.	
Total K-4 Targets for ESS = 8 **Total K-4 GSEs for ESS = 31 (K-2 = 12, Grades 3-4 = 19)**	**Total 5-8 Targets for ESS = 9** **Total 5-8 GSEs for ESS = 35 (Grades 5-6 = 23, Grades 7-8 = 12)**	**Total H.S. GSE Targets for ESS = 8** **Total H.S. GSEs for ESS = 9**	