Colorado Teacher-Authored Instructional Unit Sample

Science
4th Grade

Unit Title: Solar System

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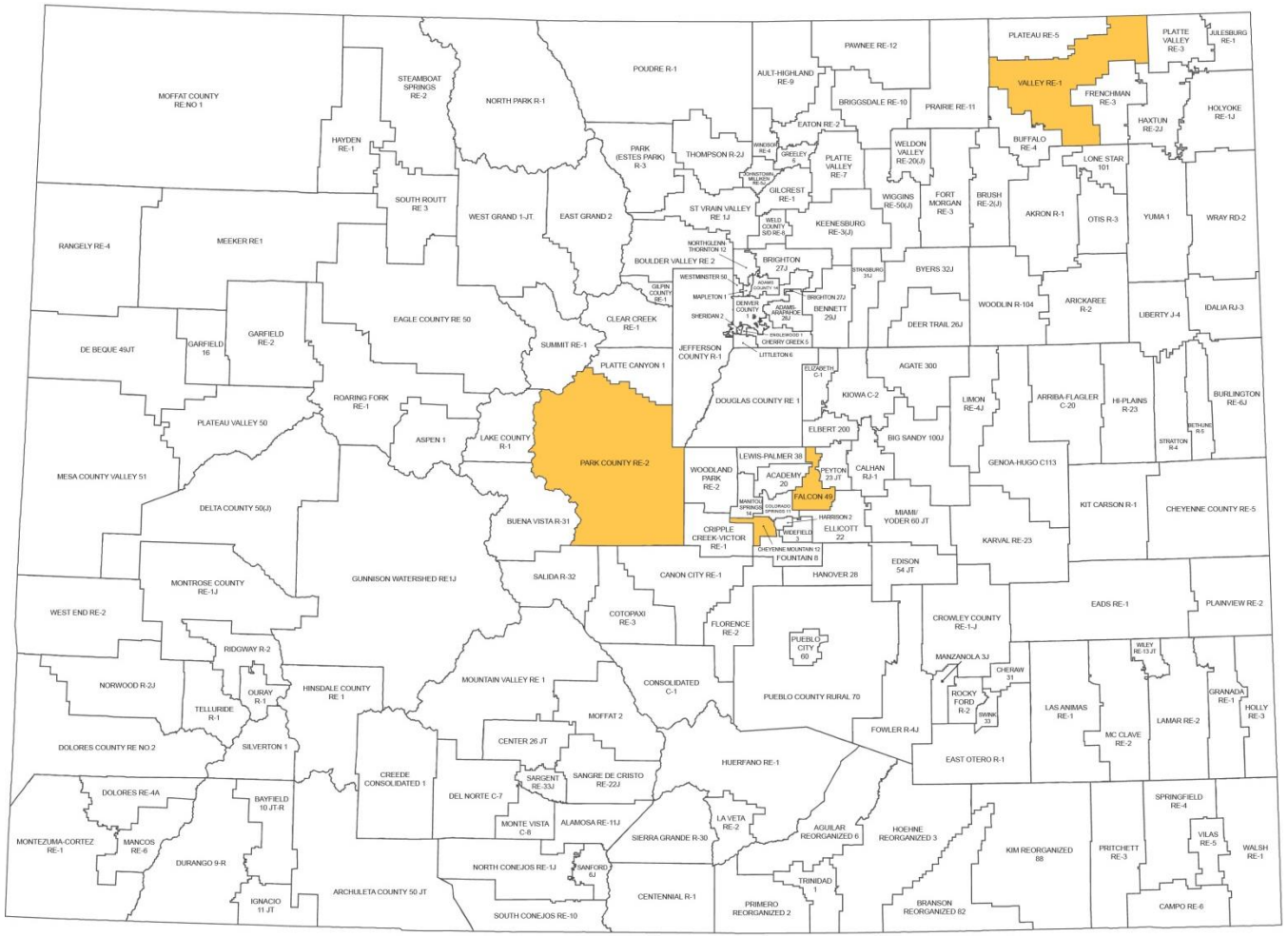

This unit was authored by a team of Colorado educators. The template provided one example of unit design that enabled teacher-authors to organize possible learning experiences, resources, differentiation, and assessments. The unit is intended to support teachers, schools, and districts as they make their own local decisions around the best instructional plans and practices for all students.

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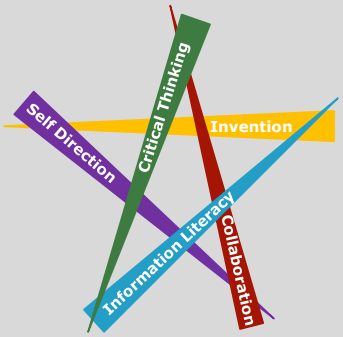
Colorado Teacher-Authored Sample Instructional Unit

Content Area	Science	**Grade Level**	4th Grade
Course Name/Course Code			

Standard	**Grade Level Expectations (GLE)**	**GLE Code**
1. Physical Science	1. Energy comes in many forms such as light, heat, sound, magnetic, chemical, and electrical	SC09-GR.4-S.1-GLE.1
2. Life Science	1. All living things share similar characteristics, but they also have differences that can be described and classified	SC09-GR.4-S.2-GLE.1
	2. Comparing fossils to each other or to living organisms reveals features of prehistoric environments and provides information about organisms today	SC09-GR.4-S.2-GLE.2
	3. There is interaction and interdependence between and among living and nonliving components of systems	SC09-GR.4-S.2-GLE.3
3. Earth Systems Science	1. Earth is part of the solar system, which includes the Sun, Moon, and other bodies that orbit the Sun in predictable patterns that lead to observable paths of objects in the sky as seen from Earth	SC09-GR.4-S.3-GLE.1

Colorado 21st Century Skills



Critical Thinking and Reasoning: *Thinking Deeply, Thinking Differently*

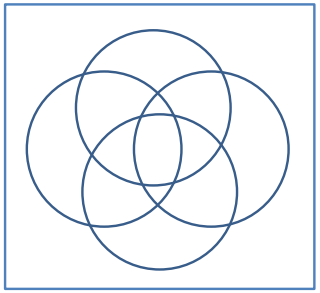
Information Literacy: *Untangling the Web*

Collaboration: *Working Together, Learning Together*

Self-Direction: *Own Your Learning*

Invention: *Creating Solutions*

Intragrated Curriculum Design: This intradisciplinary approach matches basic elements in each of the science strands – physical, life, earth systems sciences - forming overlaps in instruction of certain topics and concepts in an authentic integrated model.



Unit Titles	**Length of Unit/Contact Hours**	**Unit Number/Sequence**
Solar System	4-6 weeks	4

Unit Title	Solar System	**Length of Unit**	4-6 weeks
Focusing Lens(es)	Patterns Relationships	**Standards and Grade Level Expectations Addressed in this Unit**	SC09-GR.4-S.3-GLE.1
Inquiry Questions (Engaging-Debatable):	• What would happen if the patterns of movement for the Sun and Moon across the sky were different? (SC09-GR.4-S.3-GLE.1-EO.c; IQ.1) • How would the solar system change if Earth and other objects did not orbit the Sun? (SC09-GR.4-S.3-GLE.1-EO.a,d; IQ.2) • Why do we study the solar system? (SC09-GR.4-S.3-GLE.1-EO.a; IQ.3) • How has the study of the solar system influenced literature or music?		
Unit Strands	Earth Science		
Concepts	predictable patterns, phases, components of the solar system, orbits, revolutions, sunrise, sunset, seasons		

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
The planets and moons of the solar system travel in predictable patterns which impact all aspects of Earth life. **(**SC09-GR.4-S.3-GLE.1-EO.a,b,d; RA.1)	What are the components of the solar system? (SC09-GR.4-S.3-GLE.1-EO.a, b) What are the similarities and differences between the orbit of the earth around the sun and the orbit of the moon around the earth? (SC09-GR.4-S.3-GLE.1-EO.c; IQ.1; RA.1,3)	What are the relationships with regard to the components of the solar system? (SC09-GR.4-S.3-GLE.1-EO.a, b; RA.1)
Phases of the moon occur in a predictable pattern which directly influences the "behavior" of oceans and humans. **(**SC09-GR.4-S.3-GLE.1-EO.c; IQ.1)	What are the phases of the moon?	What are the relationships with regard to the earth and the moon?
The rotation of earth dictates sunrise (day) and sunset (night) (SC09-GR.4-S.3-GLE.1-EO.c; IQ.1; N.1)	What is revolution? (SC09-GR.4-S.3-GLE.1-EO.c; IQ.1) How does the earth rotate? (SC09-GR.4-S.3-GLE.1-EO.c; IQ.1)	How does earth's revolution cause the appearance of the sun moving across the sky? (SC09-GR.4-S.3-GLE.1-EO.c; IQ.1)
Seasons occur predictably due to the earth's tilt and orbit around the sun. (SC09-GR.4-S.3-GLE.1-EO.c; RA.3; N.1)	How does the earth's tilt and orbit cause the seasons? (SC09-GR.4-S.3-GLE.1-EO.c; IQ.3)	What are the relationships with regard to the earth and sun? (SC09-GR.4-S.3-GLE.1-EO.c; IQ.3)

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• The components of the solar system (SC09-GR.4-S.3-GLE.1-EO.a; RA.1,2) • The connections between Sunrise and sunset and the rotation of the earth on its axis (SC09-GR.4-S.3-GLE.1-EO.a; RA.3) • The phases of the moon (SC09-GR.4-S.3-GLE.1-EO.c; IQ.1; N.1) • The universe as a system with interdependent parts (SC09-GR.4-S.3-GLE.1-EO.b,d; N.2) • The relationship between seasons and the Earth's tilt on its axis and orbit around the sun (SC09-GR.4-S.3-GLE.1-EO.d)	• Model or diagram the phases of the moon (SC09-GR.4-S.3-GLE.1-EO.c; IQ.1; N.1) • Interpret data about the components of the solar system (SC09-GR.4-S.3-GLE.1-EO.a; RA.1, 2) • Compare Earth to other objects orbiting the sun (SC09-GR.4-S.3-GLE.1-EO.d; IQ.2; N.2) • Develop a scientific explanation regarding relationships of the components of the solar system (SC09-GR.4-S.3-GLE.1-EO.a,d; IQ.2,3; RA.1,2)

Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline. EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*	
A student in _____ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*I can identify the components of the solar system and explain the relationships among the components.* *I can predict Earth's observable patterns such as phases of the moon, seasons, sunrise and sunset.*
Academic Vocabulary:	gather, analyze, interpret, data, components, investigate, relationships, predictable, patterns
Technical Vocabulary:	phases, seasons, solar system, sunrise, sunset, orbit, axis, space, revolutions, comets, moon, earth, planets, waning, waxing, quarter, full moon, new moon

Unit Description:	This unit introduces the components of the solar system, which include the earth, moon, and sun, and examines the relationship between them. It also focuses on how the revolution of the earth, in relation to the sun, impacts life on earth through predictable patterns such as seasons, moon phases, and sunrise and sunset. Beginning with the components of the solar system, across the unit students investigate the Earth, the moon, the sun, the difference between revolution and rotation, predictable patterns, and the seasons. The unit culminates in a performance assessment that asks students to take the role of a news reporter asked to report to their local community on potential changes that could be observed in Colorado if a meteor hit Earth.
Considerations:	**Considerations:** Teachers may need to consider timing of the unit depending on how often science is taught in the district. Teachers need to be sure to teach the difference between revolution and rotation. Teachers need to teach both orbit and revolution. Teachers need to understand that magnets have a magnetic force, not a gravitational force. Teachers need to understand that learning experience # 9's assessment will take four weeks to complete, so plan accordingly. **Possible misconceptions:** Earth is farther from the sun in the winter.
Unit Generalizations	
Key Generalization:	The planets and moons of the solar system travel in predictable patterns which impact all aspects of Earth life
Supporting Generalizations:	Phases of the moon occur in a predictable pattern which directly influences the "behavior" of oceans and humans
	The rotation of earth dictates sunrise (day) and sunset (night)
	Seasons occur predictably due to the earth's tilt and orbit around the sun

Performance Assessment: *The capstone/summative assessment for this unit.*	
Claims: (Key generalization(s) to be mastered and demonstrated through the capstone assessment.)	The planets and moons of the solar system travel in predictable patterns which impact all aspects of Earth life.
Stimulus Material: (Engaging scenario that includes role, audience, goal/outcome and explicitly connects the key generalization)	A meteor is on track to hit the earth which will eliminate the tilt of the earth. You are a news reporter asked to report to your local community on potential changes that could be observed in Colorado. Your report needs to include changes that would occur across a calendar year in relation to predictable patterns of the seasons, sunrise and sunset, and human behaviors as a result of the impact from the meteor.
Product/Evidence: (Expected product from students)	A meteor is on track to hit the earth which will eliminate the tilt of the earth. Students are given the role of a news reporter asked to report to their local community on potential changes that could be observed in Colorado. Students must include the predictable patterns in relation to the seasons (all four seasons would not be experienced), sunrise and sunset (the time of day/night would be the same), and human behaviors as a result of the impact from the meteor.
Differentiation: (Multiple modes for student expression)	• The teacher may allow the presentation/report to be written, oral, Power Point, Prezi, Voicethread, video, photographs, etc. • The teacher may incorporate accommodations/modifications within IEPs • To extend this work, students can predict what would happen if the meteor hit the earth at a specific time and location.

Texts for independent reading or for class read aloud to support the content

Informational/Non-Fiction	Fiction
The Solar System - Greg Vogt [lexile level 490] *The Solar System* **-** Emily Bone [lexile level 690] *Solar System* **-** Lisa E. Greathouse [lexile level 940] *Earth* **-**Adele Richardson [lexile level 610] *Earth* **-** William B. Rice [lexile level 430]	*Earth Alert* -Andrew Whitmore [lexile level 860] *The Earth Cries Out* - Kenneth McIntosh [lexile level 900] *Star Searches* **-**Cynthia Mercati [lexile level 490] *Horton Hears a Who* - Dr. Seuss [lexile level 490]

Ongoing Discipline-Specific Learning Experiences

1.	Description:	Thinking like a scientist: Searching for and identifying predictable patterns	Teacher Resources:	http://www.cfa.harvard.edu/smg/Website/UCP/ (Causal patterns in science) http://patternsinscience.tumblr.com/ (Patterns in science website with images and activities) https://www.teachingchannel.org/videos/teaching-patterns (The teaching channel- video on teaching patterns through integration of math, science, and language arts) http://www.causalpatterns.org/causal/causal_defined.php (Video about big ideas of patterns) http://www.christina.k12.de.us/Science/pdf/LFS/Gr4-Sky-Watchers-LFS-Map.pdf (lesson plan for observable patterns with earth, sun and moon)
			Student Resources:	http://www.brainpopjr.com/math/geometry/patterns/preview.weml (Brainpop on patterns)
	Skills:	Identify patterns in systems Describe how and why patterns are predictable	Assessment:	The student will be assessed within the learning experiences

Prior Knowledge and Experiences

Students must have a basic understanding of the seasons (winter, spring, summer, fall), research skills, concepts of direction (north, south, east, west), concepts of day and night, math fractions (0, ¼. ½, ¾, 1), use of technology, interpreting data, and the calendar (months, weeks, days).

Vertical Articulation: Students have last seen concepts related to the concepts within this unit is PK (solar system) and 2nd grade (seasons).

Learning Experiences # 1 – 4
Instructional Timeframe: Weeks 1-2

Learning Experience # 1		
The teacher may bring in artifacts and images of space exploration tools so that students can gather initial information on how scientists study our solar system.		
Generalization Connection(s):	The planets and moons of the solar system travel in predictable patterns which impact all aspects of Earth life	
Teacher Resources:	http://spaceplace.nasa.gov/review/story-space-tools/supercool_space_tools_single_pages.pdf (Super cool space tools) http://mrsharmonscience.weebly.com/uploads/1/3/2/2/13222665/completed_space_tool_chart.pdf (Tools used to study space) https://solarsystem.nasa.gov/history/timeline.cfm?Section=2 (NASA solar system historical timeline) http://www.superteacherworksheets.com/solar-system-planets.html (Scavenger hunt of the solar system) http://www.shutterstock.com/cat.mhtml?searchterm=telescope&search_group=&lang=en&search_source=search_form (Telescope images) https://www.google.com/#q=timetoast (Online- timeline creator)	
Student Resources:	http://astronomyonline.org/Science/Equipment.asp (Astronomy tools and equipment)	
Assessment:	The student will engage in research (web-quest) that identifies key people and tools in order to create a timeline that are important to the discovery and on-going research of our solar system. https://www.google.com/#q=timetoast (Online- timeline creator)	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to work in groups The teacher may allow students to cut and paste images into their timeline The teacher may provide a template for the timeline	The student may create a timeline using images
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to build a telescope	The student may build a telescope and present how it works to the class The student may present their timeline and describe one or two elements within the timeline
Critical Content:	• Telescopes • Satellite • Galileo • NASA • Space station • Probes • Observatory • Indigenous beliefs about sky	

Key Skills:	• Create a historical timeline • Gathering information
Critical Language:	Telescope, satellite, Galileo, NASA, space station, probes, Indigenous beliefs about sky ,observatory, create, gather

Learning Experience # 2		
The teacher may use storytelling (e.g., Horton Hears a Who) and/or artifacts (e.g., globe, Google maps) to introduce the concept of scale so that students can begin to understand how the size of the solar system compares to their place within the solar system.		
Generalization Connection(s):	The planets and moons of the solar system travel in predictable patterns which impact all aspects of Earth life	
Teacher Resources:	http://www.youtube.com/watch?v=h5bVZTpVxy4 (You tube around scale and the solar system) http://mcdonaldobservatory.org/teachers/classroom (Activities about scale and the solar system) https://www.google.com/search?espv=210&es_sm=93&tbm=isch&source=univ&sa=X&ei=FAQVU_2hMoGMyQGG7oCgAg&ved=0CDEQsAQ&biw=1093&bih=534&q=teaching%20kids%20about%20size%20scale (Images for teaching kids about scale) http://www.ase.org.uk/journals/school-science-review/2001/06/301/1312/SSR301Jun2001p27.pdf (Children's understanding of scale using the microscope) http://overtheretohere.com/how-to-compare-planet-sizes-teach-kids/ (Helping kids understand scale) http://www.youtube.com/watch?v=KB6d1S-hD5w (You tube on size and scale)	
Student Resources:	http://www.youtube.com/watch?v=aY_NfuZlFxc (You tube of solar system scale) http://www.youtube.com/watch?v=KB6d1S-hD5w (You tube on size and scale) http://www.youtube.com/watch?v=NEsP8yD86lI (Sea creatures size and scale) http://www.youtube.com/watch?v=h_7wV1OzTX8 (Big and small song for kids)	
Assessment:	The student will use Google Earth maps to create a storyboard that captures 3-5 images at different scales (view of the United States, view of Colorado, view of a city, and view their home or school street). http://www.printablepaper.net/category/storyboard (Storyboard graphic organizer) http://www.google.com/earth/ (Google Earth)	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to work in groups The teacher may create icons for scale for students to cut and paste into a flow map https://www.google.com/search?q=flow+map&tbm=isch&tbo=u&source=univ&sa=X&ei=3lsPU_eOOob2rAHHvYCgCA&sqi=2&ved=0CCQQsAQ&biw=1024&bih=648 (Images of flow maps) The teacher may provide the starting place within the storyboard The teacher may reduce the number of required elements within storyboard	The student may verbally present their understanding of scale

Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may extend on students mathematical knowledge by allowing them to use ratios within their storyboard	The student may incorporate ratios into their storyboard
Critical Content:	• Concept of scale	
Key Skills:	• Observe a map or a globe • Create a storyboard	
Critical Language:	Scale, observe, create	

Learning Experience # 3		
The teacher may provide simulations (video, internet resources, etc.) of the solar system so that students can begin to identify its components.		
Generalization Connection(s):	The planets and moons of the solar system travel in predictable patterns which impact all aspects of Earth life	
Teacher Resources:	http://www.mrnclass.com/solarsystemplanetreport/ (4th grade classroom resources made by another teacher) http://solarsystem.nasa.gov/planets/ (NASA solar system exploration) https://www.google.com/search?q=components+of+the+solar+system&espv=210&es_sm=93&tbm=isch&tbo=u&source=univ&sa=X&ei=TQEVU9jkJMWZrgHx14DABA&sqi=2&ved=0CFAQsAQ&biw=1093&bih=534 (Images for components of the solar system) http://www.superteacherworksheets.com/solar-system-planets.html (Solar system resources and worksheets) http://www.messenger-education.org/teachers/Modules/Lessons/ourss.pdf (Journey through our solar system lesson) http://www.enchantedlearning.com/subjects/astronomy/solarsystem/activities.shtml (Solar system learning activities)	
Student Resources:	http://solarsystem.nasa.gov/planets/ (NASA solar system exploration) https://www.google.com/search?q=components+of+the+solar+system&espv=210&es_sm=93&tbm=isch&tbo=u&source=univ&sa=X&ei=TQEVU9jkJMWZrgHx14DABA&sqi=2&ved=0CFAQsAQ&biw=1093&bih=534 (Images for components of the solar system) http://www.neok12.com/Solar-System.htm (Solar system games and simulations) http://www.youtube.com/watch?v=K5mgTBkDaCs (You tube on the solar system)	
Assessment:	The students, as a class, will work together to construct a scale model of the solar system and its components (e.g., playground/football field, etc.).	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to work in groups The teacher may limit the number of components to identify within the model http://bogglesworldesl.com/kids_worksheets/solarsystem.htm (Resources for working with ESL learners and the solar system)	N/A

Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow further research on additional components of our solar system and/or our solar system's galaxy	The student may identify additional components to the solar system The student may work to identify our solar system's galaxy
Critical Content:	• Solar system • Sun • Comets • Stars • Moon • Planets • Meteor • Earth • Asteroids	
Key Skills:	• Construct a model of the solar system • Identify components of the solar system	
Critical Language:	Solar system, sun, comets, stars, moon, planets (Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune), meteor, Earth, asteroids, construct, identify	

Learning Experience # 4	
The teacher may physically model orbiting/revolving around a center so that students can experience the movement of the components of the solar system around the sun.	
Generalization Connection(s):	The planets and moons of the solar system travel in predictable patterns which impact all aspects of Earth life
Teacher Resources:	https://www.google.com/search?q=planets+orbiting+the+sun&espv=210&es_sm=93&tbm=isch&tbo=u&source=univ&sa=X&ei=XAAVU639NIqxrQGXq4HAAg&sqi=2&ved=0CCQQsAQ&biw=1093&bih=534 (Images of planets orbiting the sun) http://spaceplace.nasa.gov/review/dr-marc-solar-system/planet-orbits.html (NASA space page about planets orbiting the sun) http://www.kidsastronomy.com/solar_system.htm (Kid's astronomy site with simulation and information)
Student Resources:	https://www.google.com/search?q=planets+orbiting+the+sun&espv=210&es_sm=93&tbm=isch&tbo=u&source=univ&sa=X&ei=XAAVU639NIqxrQGXq4HAAg&sqi=2&ved=0CCQQsAQ&biw=1093&bih=534 (Images of planets orbiting the sun) http://www.kidsastronomy.com/solar_system.htm (Kid's astronomy site with simulation and information) http://www.youtube.com/watch?v=WgLviwOsok4 (You tube for planets orbiting the sun) http://lasp.colorado.edu/education/outerplanets/orbit_simulator/ (Orbit simulator)
Assessment:	The student will demonstrate orbiting/revolving using various manipulatives and document visually in their science notebooks.

Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to work in groups The teacher may aide support to help students verbalize their understanding	N/A
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	N/A
Critical Content:	• Sun at center • Orbit • Revolution • Predictable patterns	
Key Skills:	• Demonstrate orbiting/revolving • Compare and contrast patterns of planets	
Critical Language:	Sun at center, orbit, revolution, predictable patterns, demonstrate, compare, contrast	

Learning Experiences # 5 – 7
Instructional Timeframe: Weeks 2-3

Learning Experience # 5	
The teacher may use a globe of the earth to identify poles, hemispheres, and the equator so the student can begin to understand the tilt and position of earth.	
Generalization Connection(s):	Seasons occur predictably due to the earth's tilt and orbit around the sun The rotation of earth dictates sunrise (day) and sunset (night)
Teacher Resources:	https://www.google.com/search?q=earth%27s+poles+and+hemispheres&sa=X&espv=210&es_sm=93&tbm=isch&tbo=u&source=univ&ei=tP0UU6DwEo3lyAGhroGoCg&ved=0CD4QsAQ&biw=1093&bih=534 (Images of earth's poles and hemispheres) http://science.howstuffworks.com/environmental/earth/geophysics/question782.htm (How stuff works-Earth's poles) http://www.scholastic.com/teachers/article/magnetic-north-pole (Scholastic article on earth's magnetic poles) http://www.uen.org/Lessonplan/preview.cgi?LPid=2704 (Activity on finding magnetic poles) http://www.lessonplanet.com/lesson-plans/north-and-south-poles (lesson planet lessons on hemispheres and poles)
Student Resources:	https://www.google.com/search?q=earth%27s+poles+and+hemispheres&sa=X&espv=210&es_sm=93&tbm=isch&tbo=u&source=univ&ei=tP0UU6DwEo3lyAGhroGoCg&ved=0CD4QsAQ&biw=1093&bih=534 (images of earth's poles and hemispheres)
Assessment:	The student will create a model (using materials such as: an orange, Styrofoam ball, play-doh, etc.) of the earth by labeling poles, hemispheres, and equator.

Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide labels for the models The teacher may assign groups	N/A
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may request students identify the hemisphere in which they live	The student may identify the correct hemisphere in which they live
Critical Content:	• North pole, south pole, north hemisphere, south hemisphere, equator, earth	
Key Skills:	• Create a model • Identify and label the model	
Critical Language:	North pole, south pole, north hemisphere, south hemisphere, equator, earth, create, identify, label	

Learning Experience # 6		
The teacher may engage students in various hands-on activities that the student can begin to understand how the rotation of earth relates to night and day.		
Generalization Connection(s):	The rotation of earth dictates sunrise (day) and sunset (night)	
Teacher Resources:	http://notebookingfairy.com/wp-content/uploads/2011/03/KWL-graphic-organizer.gif (KWL chart) https://encrypted-tbn1.gstatic.com/images?q=tbn:ANd9GcSbBdo-fSDsa1gBbziMaz09jP4wyO19gCYGetkjC0tPbHKGGpYarw (Visual of the sun and the earth showing night and day) https://www.youtube.com/watch?v=eUsWUiVCq5U (Video showing night in Alaska in the summer)	
Student Resources:	https://encrypted-tbn1.gstatic.com/images?q=tbn:ANd9GcSbBdo-fSDsa1gBbziMaz09jP4wyO19gCYGetkjC0tPbHKGGpYarw (Visual of the sun and the earth showing night and day) https://www.youtube.com/watch?v=eUsWUiVCq5U (Video showing night in Alaska in the summer)	
Assessment:	The students will work with a partner, one holding a model of the sun the other holding a model of the earth, to demonstrate that the Earth fully rotates on its axis on one Earth day.	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	N/A	The student may verbally present their understanding to the teacher to complete the (L) section of the chart
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to produce a video that demonstrates the movement	The student may complete a presentation demonstrates the movement

Critical Content:	• Sunrise (day), sunset (night), rotation, sun, earth
Key Skills:	• Understand, brainstorm, investigate, complete, highlight, present
Critical Language:	Sunrise (day), sunset (night), rotation, sun, earth, understand, brainstorm, investigate, complete, highlight, present

Learning Experience # 7		
The teacher may provide interactive experiences so the student can connect the position of the Earth (tilt/angle) to seasons and seasonal change.		
Generalization Connection(s):	Seasons occur predictably due to the earth's tilt and orbit around the sun	
Teacher Resources:	http://sciencenetlinks.com/lessons/the-four-seasons/ (To understand that it is the tilt of earth's axis that causes the seasons.) http://www.kid-friendly-homeschool-curriculum.com/support-files/2weatherb1.pdf (Blank chart for assessment) http://www.sascurriculumpathways.com/portal/Launch?id=1386 (SAS virtual lab to show seasons) http://danitamatt.edublogs.org/files/2010/04/seasons1.JPG (Example of an extended assessment) https://www.youtube.com/watch?v=Pgq0LThW7QA (Video of the reason for the seasons) http://highered.mcgraw-hill.com/sites/007299181x/student_view0/chapter2/seasons_interactive.html (Virtual lab showing seasons in the northern hemisphere. Axis angle can be changed) http://lewamplerlab.weebly.com/seasons.html (Lab on seasons) http://www.sascurriculumpathways.com/portal/Launch?id=1386 (Investigate earth's motions and discover what causes earth's seasons, observe how these motions affect our view of the sun, and examine seasonal changes and events) http://www.learner.org/teacherslab/pup/ (My Private Universe project-seasons and Moon phase misconceptions)	
Student Resources:	http://www.sascurriculumpathways.com/portal/Launch?id=1386 (Virtual lab on seasons) http://www.sascurriculumpathways.com/portal/Launch?id=1386 (Investigate earth's motions and discover what causes earth's seasons, observe how these motions affect our view of the sun, and examine seasonal changes and events) http://www.windows2universe.org/earth/climate/cli_seasons.html (Earth's tilt is the reason for the seasons!) https://www.youtube.com/watch?v=Pgq0LThW7QA (Video of the reason for the seasons)	
Assessment:	The students will watch the You tube video on seasons and identify the errors within the explanations and then provide the correct rationale for why there are seasons. http://www.youtube.com/watch?v=p0wk4qG2mIg (Harvard grads explain seasons)	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide a word bank The teacher may allow for oral presentation The teacher may allow picture representation	The student may utilize a word bank to complete the assessment The student may verbally identify the relationship between the earths position and seasons in each hemisphere to the teacher The student may draw pictures to show the relationship between the earths position and seasons in each hemisphere

Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://danitamatt.edublogs.org/files/2010/04/seasons1.JPG (Example of student work)	The student may create a visual representation demonstrating the relationship between the earths position and seasons in each hemisphere without a template
Critical Content:	• Rotation, revolution, sun, Earth, seasons, axis	
Key Skills:	• Understand, create, complete, draw, utilize, identify, interact, experience,	
Critical Language:	Rotation, revolution, sun, Earth, summer, spring, winter, fall, axis, understand, create, complete, draw, utilize, identify, interact, experience	

Learning Experiences # 8 – 13
Instructional Timeframe: Weeks 4-5

Learning Experience # 8	
The teacher may use simulations (videos and internet resources) of the moon revolving around the earth, and the earth and moon revolving around the sun, so that students can begin to examine the phases of the moon and its predictable pattern of movement.	
Generalization Connection(s):	The planets and moons of the solar system travel in predictable patterns which impact all aspects of Earth life Phases of the moon occur in a predictable pattern which directly influences the "behavior" of oceans and humans
Teacher Resources:	http://home.roadrunner.com/~davejessie/_MoonPhases/Calendars/2014/MoonPhase_2014.htm (Yearly calendar of moon phases) http://www.learner.org/teacherslab/pup/ (My Private Universe project-seasons and Moon phase misconceptions) http://astro.unl.edu/naap/lps/animations/lps.swf (Moon phase simulation) http://www.fossweb.com/delegate/ssi-foss-ucm/Contribution%20Folders/FOSS/multimedia/Planetary_Science/binders/moon/moon_motions/phases_of_the_moon_simulation_1.html (Phases of the moon/day and night simulation)
Student Resources:	http://home.roadrunner.com/~davejessie/_MoonPhases/Calendars/2014/MoonPhase_2014.htm (Yearly calendar of moon phases) http://astro.unl.edu/naap/lps/animations/lps.swf (Moon phase simulation) http://www.fossweb.com/delegate/ssi-foss-ucm/Contribution%20Folders/FOSS/multimedia/Planetary_Science/binders/moon/moon_motions/phases_of_the_moon_simulation_1.html (Phases of the moon/day and night simulation)
Assessment:	The students will watch the You tube video on moon phases and identify the errors within the explanations and then provide the correct rationale for why there are phases of the moon. https://www.youtube.com/watch?v=TrXaQu_qGeo (Moon phases @ 2:31)

Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may assign groups of six (e.g. Three as sun, two as Earth, one as Moon) to kinesthetically model the orbit of the Earth and Moon around the Sun	Students may group themselves and perform a kinesthetic model of the orbit of the Earth and Moon around the Sun
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may request that students access technology independently and find multiple video simulations of the orbit of the Earth and Moon around the Sun The teacher may provide materials that facilitate creating a scale model (e.g. mobile) that accurately represents the orbit of the Earth and Moon around the Sun	The student may work independently with computers to research and view multiple video simulations of the orbit of the Earth and Moon around the Sun The student may create a scale model (eg. mobile) that accurately represents the orbit of the Earth and Moon around the Sun The student may create an illustrated month long moon phase chart that accurately depicts, labels, and dates the phases of the moon throughout the month and then provide a written summary paragraph describing and explaining their observations
Critical Content:	• Moon, sun, Earth, orbit, revolution, rotation, pattern • Observe the moon. • Illustrate the moon phases based upon observations. • Label and date moon phases. • Describe and explain observations in a written or oral summary. • Compare and contrast the dates of the full, new, and half-moon appearances and apply the concept of waxing and waning to the lunar cycle from month-to-month.	
Key Skills:	• Write a paragraph • Create an illustration • Simulation of Revolution • Create a model/mobile • Conduct independent research	
Critical Language:	Moon, sun, Earth, orbit, revolution, rotation, pattern, describe, illustrate, perform, create, model, research	

Learning Experience # 9	
The teacher may engage students in an interactive experiment on the basic laws of gravity so that students can comprehend how gravity impacts objects in space.	
Generalization Connection(s):	Phases of the moon occur in a predictable pattern which directly influences the “behavior” of oceans and humans The planets and moons of the solar system travel in predictable patterns which impact all aspects of Earth life

Teacher Resources:	http://www.slideshare.net/MMoiraWhitehouse/gravity-for-elementary-and-middle-students (Gravity slide share) http://www.kidsgen.com/school_projects/tides.htm (Hands on learning experience of understanding tides)	
Student Resources:	http://www.sascurriculumpathways.com/portal/Launch?id=950 (Explore the gravitational effects of the moon and sun on earth's oceans. You'll describe the nature of tides, discover the tide patterns for the East Coast of the United States, describe the roles of the sun and moon in …)	
Assessment:	Students will complete several activities involving gravity and record their observations and results in their science notebooks. http://sciencenetlinks.com/media/filer/2011/09/27/tf-snl-falling-for-gravity.pdf (Gravity testing scenarios)	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow the opportunity to complete the assessment with partners or small groups The teacher may modify the length of the assessment	The student may work with partners or in small groups to complete the assessment The student may complete a shortened, or modified, assessment
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	http://edhelper.com/teachers/graphic_organizers.htm (Graphic organizers) https://www.google.com/search?q=graphic+organizers&espv=210&es_sm=93&tbm=isch&tbo=u&source=univ&sa=X&ei=yfgUU7a9A-eayAG_34CQBA&ved=0CDYQsAQ&biw=1093&bih=534&dpr=1.25 (Images of graphic organizers)	Students may compare and contrast how the moon's gravity impacts the earth and the earth's gravity impacts the moon using a graphic organizer
Critical Content:	• Gravitational pull, force, weight, mass, lunar/moon phases, full moon, new moon, first quarter moon, and third quarter moon	
Key Skills:	• Observe simulations. • Interpret results of magnet and rubber band activities. • Interpret published data from tide charts.	
Critical Language:	Gravitational pull, force, weight, mass, lunar/moon phases, full moon, new moon, first quarter moon, and third quarter moon, observe, interpret, compare, present	

Learning Experience # 10	
The teacher may use texts (informational and fictional) and images related to the moon and oceans so that students can begin to comprehend the relationship between tides and gravitational pull.	
Generalization Connection(s):	Phases of the moon occur in a predictable pattern which directly influences the "behavior" of oceans and humans
Teacher Resources:	http://www.naturebridge.org/sites/default/files/Gravity%20and%20Tides.pdf (Nature Bridge Tides & Gravity) http://www.kidsgen.com/school_projects/tides.htm (Hands on learning experience of understanding tides)

<table>
<tr><td>Student Resources:</td><td colspan="2">http://www.surf-forecast.com/breaks/Malibu_1/tides/latest (Malibu Tide Times & Tide Charts)
www.indosurflife.com/surfreports/tidecharts (Indo Surf Life)
http://www.lawrencevilleweather.com/tides/barnegat+light+nj (Lawrenceville Weather)
http://www.sascurriculumpathways.com/portal/Launch?id=950 (Explore the gravitational effects of the moon and sun on earth's oceans. You'll describe the nature of tides, discover the tide patterns for the East Coast of the United States, describe the roles of the sun and moon in …)</td></tr>
<tr><td>Assessment:</td><td colspan="2">Students will compare a published tide chart and determine how many times per day high and low tide occur, and then compare what happens on the tide chart during the full, new, first, and third quarter moons.

http://www.surf-forecast.com/breaks/Malibu_1/tides/latest (Malibu Tide Times & Tide Charts)</td></tr>
<tr><td rowspan="2">Differentiation:
(Multiple means for students to access content and multiple modes for student to express understanding.)</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>The teacher may allow for oral presentation of both knowledge gained and predictions
The teacher may allow for an illustration that demonstrates both knowledge gained and predictions</td><td>The student may present findings verbally to demonstrate both knowledge gained and predictions</td></tr>
<tr><td rowspan="2">Extensions for depth and complexity:</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>Teacher may provide resources to compare and contrast the Pacific Ocean tide charts and the Atlantic Ocean tide charts during the same day and/or moon cycle</td><td>The student may compare and contrast the Pacific Ocean tide charts and the Atlantic Ocean tide charts during the same day and/or moon cycle</td></tr>
<tr><td>Critical Content:</td><td colspan="2">• Gravity, gravitational pull, oceans, tide, high tide, low tide, scientific behavior</td></tr>
<tr><td>Key Skills:</td><td colspan="2">• Read or Listen to comprehend information in both Non-Fiction and Fictional Text
• Interpret information from both video and photographic depictions of tides
• Brainstorm to make predictions about the moon’s effect on the behaviors of humans and animals
• Create visual representation (e.g. KWL Chart, CPW, mind-map) to convey what they have learned about the moon’s effect on oceans, and how they think they moon effects humans and animals</td></tr>
<tr><td>Critical Language:</td><td colspan="2">Gravity, gravitational pull, oceans, tide, high tide, low tide, scientific behavior, create, summarize, predict, infer, cause & effect, read, listen, observe</td></tr>
</table>

Learning Experiences # 11-12
Instructional Timeframe: Week 6

Learning Experience # 11		
The teacher may provide data or charts (such as moon phases, sunrise/sunset, earth's season chart and a calendar) so that students can recognize predictable patterns (including: day, night, year, moon phases, seasons).		
Generalization Connection(s):	Seasons occur predictably due to the earth's tilt and orbit around the sun Phases of the moon occur in a predictable pattern which directly influences the "behavior" of oceans and humans The rotation of earth dictates sunrise (day) and sunset (night) The planets and moons of the solar system travel in predictable patterns which impact all aspects of Earth life	
Teacher Resources:	http://www.mos.org/sites/dev-elvis.mos.org/files/docs/offerings/mos_activity-sheet_explore-the-galaxy.pdf (Patterns in our solar system activity sheet) https://www.google.com/search?q=patterns+in+our+solar+system&espv=210&es_sm=93&tbm=isch&tbo=u&source=univ&sa=X&ei=WfsUU4_tDMbgyQG41oDgDw&ved=0CD8QsAQ&biw=1093&bih=534 (Images for patterns in our solar system)	
Student Resources:	N/A	
Assessment:	The student will record, in their science notebooks, why day/night, seasons, and moon phases occur in predictable patterns.	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide access to key vocabulary words The teacher may provide other modalities for learners to demonstrate their knowledge	The student may utilize vocabulary words to assist in the explanation The student may demonstrate their knowledge of predictable patterns through pictures, written expression, or the use of models
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide an opportunity to teach this concept to younger kids	Student may choose one predictable pattern to create a children's book explaining the pattern to younger peers
Critical Content:	• Predictable, patterns, revolution, rotation, axis, sunrise, sunset, seasons, moon phases	
Key Skills:	• Utilize, explain, recognize, demonstrate, create	
Critical Language:	Predictable, patterns, revolution, rotation, axis, sunrise, sunset, night, day, seasons, fall, winter, spring, summer, moon phases, waning, waxing, full moon, quarter moon, half moon, new moon, utilize, explain, recognize, demonstrate, create	

Learning Experience # 12		
The teacher may use experiments on the effects of disrupted patterns within our solar system (e.g., removing the sun from the center, changing the earth's position within our solar system, eliminating the earth's rotation) so that students can predict what changes might occur in an altered/alternate system.		
Generalization Connection(s):	Seasons occur predictably due to the earth's tilt and orbit around the sun Phases of the moon occur in a predictable pattern which directly influences the "behavior" of oceans and humans The rotation of earth dictates sunrise (day) and sunset (night) The planets and moons of the solar system travel in predictable patterns which impact all aspects of Earth life	
Teacher Resources:	http://www.dailymail.co.uk/sciencetech/article-2385401/A-storm-coming-Suns-magnetic-field-set-FLIP-lead-bad-weather-radio-disruption.html (Article on disruptions in patterns within solar system) https://www.google.com/search?q=DISRUPTING+patterns+in+our+solar+system&espv=210&es_sm=93&tbm=isch&tbo=u&source=univ&sa=X&ei=jfwUU5CaOuXEyQGZoIGQBA&ved=0CF0QsAQ&biw=1093&bih=534 (Images for disrupting patterns in the solar system)	
Student Resources:	https://www.google.com/search?q=DISRUPTING+patterns+in+our+solar+system&espv=210&es_sm=93&tbm=isch&tbo=u&source=univ&sa=X&ei=jfwUU5CaOuXEyQGZoIGQBA&ved=0CF0QsAQ&biw=1093&bih=534 (Images for disrupting patterns in the solar system)	
Assessment:	The student will complete a storyboard depicting one major disrupted pattern and the effects. http://www.printablepaper.net/category/storyboard (Storyboard graphic organizer)	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to work in groups The teacher may allow fewer examples of cause and effect The teacher may provide the causes and effects in a matching format	The student may present their understanding verbally The student may use drawings within their graphic organizer The student may match the correct cause to the effect
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to analyze how the predicted changes will affect the patterns in their own lives The teacher may complete the effects of a disruption in a pattern	The student may create a presentation (Power Point, Voicethread, video etc.) around how their lives with be affected by the disruption of patterns with our solar system The student may identify the causes of the disruptions in patterns
Critical Content:	• Predictable patterns • Seasons • Sunrise • Sunset • Sun at the center • Rotation • Revolution • Moon phases	

Key Skills:	• Predict what changes will occur if existing patterns in our solar system are disrupted • Create graphic organizer • Analyze cause and effect of disruptions in patterns that exist within our solar system
Critical Language:	Predictable patterns, seasons, sunrise, sunset, sun at the center, rotation, revolution, moon phases, predict, create, analyze, cause and effect