COURSE/SUBJECT: Science

LEVEL/GRADE: 6th Grade

UNIT/FOCUS: Intro to Earth Systems

TIMEFRAME: 7 Weeks

Transfer

Students will be able to independently use their learning to…

- Develop and use a model to describe phenomena. (MS-ESS2-1)
- Develop a model to describe unobservable mechanisms. (MS-ESS2-4)

Meaning

Enduring Understandings (EUs)	Essential Questions (EQs)
Students will understand that…	*Students will keep considering…*
• Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4) • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)	• How do the properties and movements of water shape Earth's surface and affect its systems? • What regulates weather and climate? • How do particles combine to form the variety of matter one observes? • What is energy?

Acquisition

Knowledge	Skills
Students will know…	*Students will be able to…*
• Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4) • Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4) • Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6) • Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4) • In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4) • The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4) • The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4) • The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal	• MS-ESS2-4 Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. • MS-PS1-4 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (secondary to MS-PS1-4)	

Aligned Concepts, Topics, and Skills

Topics:
- Properties of Matter- solids, liquids, gases
- Phase changes- evaporation, condensation, freezing, melting
- Kinetic-Molecular Theory of Matter
- Water Cycle
- Composition of Earth's Atmosphere- gases, aerosols
- Air Pressure

Natural Phenomenon:
- It is harder to breathe at the top of a mountain than at sea level.
- Water on earth exists as a solid, liquid and a gas.
- Fog on a bathroom mirror.
- The grass is wet some mornings and it didn't rain.
- I can see my breath in the winter but not in the summer.
- Clouds form.
- Fog forms over water or moist areas in the morning on cool days.

Pacing Guide

- Approximately 7 weeks for unit

21st Century Life and Career Ready Practices

- CRP1. Act as a responsible and contributing citizen and employee.
- CRP2. Apply appropriate academic and technical skills.
- CRP3. Attend to personal health and financial well-being.
- CRP4. Communicate clearly and effectively and with reason.
- CRP5. Consider the environmental, social and economic impacts of decisions.
- CRP6. Demonstrate creativity and innovation.
- CRP7. Employ valid and reliable research strategies.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP9. Model integrity, ethical leadership and effective management.
- CRP10. Plan education and career paths aligned to personal goals.
- CRP11. Use technology to enhance productivity.
- CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

- Science and Engineering Practices
- Cross-Cutting Concepts

Instructional Resources

- Middle School Chemistry (ACS) www.middleschoolchemistry.com (Ch 1-3)
- USGS Water Cycle for Schools http://water.usgs.gov/edu/watercycle-kids.html
- USGS Water Cycle Adults (for higher learners) http://water.usgs.gov/edu/watercycle.html
- AGI Earth Science Week Activities: http://www.earthsciweek.org/big-ideas
- AGI Earth Science Week Videos: https://www.youtube.com/user/AGIeducation/videos
    - Why Earth Science

Benchmark / Summative Assessments

Teacher created:
- Model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity
- Model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed

○ Big Idea 1: Earth Scientists Study Our Planet ○ Big Idea 3: Earth's Systems Interact • GPM-Precipitation Education (NASA): https://pmm.pps.eosdis.nasa.gov/education/	
Supports / Modifications for ELLs	**Supports / Modifications for Students w/ 504s and or IEPs**
• Preview content • Utilize visuals, images, actions, and talk • Scaffold development of comprehension process vocabulary AND content-specific vocabulary • Display anchor charts for language structures • Provide assessments with graphic supports • Utilize prepared sentence stems • Graphic organizers • Flexible grouping • Additional time for processing and assessment	• Differentiate content, process, product, and learning environment • Provide alternative or high interest text at student's reading level. • Provide summaries of materials for student. • Shorten assignments and assessments to focus on mastery of key concepts. • Substitute alternatives for written assignments. • Specify and review often exactly what the student will need to learn to pass. • Modify expectations based on student needs. • Provide a "designated notetaker" or photocopy of other student or teacher notes. • Provide a print copy of assignments or notes. • Go over directions orally. • Provide additional time on tests. • Read test materials to the student, and allow oral responses. • Use enlarged graph paper to write problems to help the student keep numbers in columns. • Break long-term assignments into small steps, with daily monitoring and frequent grading. • Use both oral and printed directions.
Supports / Modifications for At Risk Students	**Supports / Modifications for Gifted & Talented Students**
• Review the classroom rules frequently. • Evaluate classroom structure against the student's needs (flexible structure, firm limits, etc.). • Keep workspace clear of unrelated materials. • Keep classroom quiet during intense learning times. • Reduce visual distractions in the classroom (mobiles, etc.). • Seat the student close to the teacher / instruction, and away from distractions. • Keep extra supplies of classroom materials (pencils, books) on hand. • Alert student several minutes before a transition from one activity to another is planned; give several reminders. • Reinforce (often) when a student displays positive behavior. • Develop an individualized behavior intervention plan that consistent with the student's ability and skills. • Arrange for a student to leave the classroom for a designated "safe place" when highly stressed. • Develop a system or a code word to let a student know when behavior is not appropriate. • Ignore behaviors that are not seriously disruptive.	• Provide opportunities to pursue advanced level work • Expose students to higher level thinking skills • Provide enrichment centers • pursue a self-selected interest • work in groups with students having common interests • move to a higher grade for specific subject area instruction • work with students of comparable ability across classrooms at the same grade level • work on an advanced curriculum unit on a teacher-selected topic • participate in competitive programs focusing on thinking skills/problem solving • receive concentrated instruction in critical thinking and creative problem solving

COURSE/SUBJECT: Science

LEVEL/GRADE: 6th Grade

UNIT/FOCUS: Earth & Space Systems

TIMEFRAME: 7 Weeks

Transfer

Students will be able to independently use their learning to…

- Develop and use a model to describe phenomena. (MS-ESS1-1),(MS-ESS1-2)
- Analyze and interpret data to determine similarities and differences in findings. (MS-ESS1-3)

Meaning

Enduring Understandings (EUs)	Essential Questions (EQs)
Students will understand that… • Patterns can be used to identify cause-and-effect relationships. (MS-ESS1-1) • Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3) • Systems and System Models can be used to represent systems and their interactions. (MS-ESS1-2)	*Students will keep considering…* • What is the universe, and what goes on in stars? • What are the predictable patterns caused by Earth's movement in the solar system?

Acquisition

Knowledge	Skills
Students will know… • Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) • Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2) • The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MS-ESS1-3) • This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1) • The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)	*Students will be able to…* • MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons • MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system • MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

COURSE/SUBJECT: Science **LEVEL/GRADE**: 6th Grade

Aligned Concepts, Topics, and Skills

Topics:
- Solar System
- Gravity
- Lunar Phases & Eclipses
- Seasons

Natural Phenomenon:
- The moon looks different in the sky each night
- I can't see Orion's belt in July
- The day is longer in the summer
- The sun is higher in the sky in the summer
- Saturn has rings and moons
- Sometimes the moon looks orange

Pacing Guide

- Approximately 7 weeks for unit

21st Century Life and Career Ready Practices

- CRP1. Act as a responsible and contributing citizen and employee.
- CRP2. Apply appropriate academic and technical skills.
- CRP3. Attend to personal health and financial well-being.
- CRP4. Communicate clearly and effectively and with reason.
- CRP5. Consider the environmental, social and economic impacts of decisions.
- CRP6. Demonstrate creativity and innovation.
- CRP7. Employ valid and reliable research strategies.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP9. Model integrity, ethical leadership and effective management.
- CRP10. Plan education and career paths aligned to personal goals.
- CRP11. Use technology to enhance productivity.
- CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

- Science and Engineering Practices
- Cross-Cutting Concepts

Instructional Resources

- Pocket Solar System Model: http://solarsystem.nasa.gov/educ/pocketss
- Cassini Scientist for a Day Essay Contest: http://saturn-archive.jpl.nasa.gov/education/scientistforaday2015/ (good extention assignment)
- NASA- Saturn Educator Guide: http://saturn-archive.jpl.nasa.gov/education/EDUCATION58Program/education58guide/
- Why are there moon phases? interactive: http://cimss.ssec.wisc.edu/wxfest/MoonPhases/moonphases.html
- Eclipses- Crash Course Astronomy #5: https://www.youtube.com/watch?v=PRgua7xceDA
- NASA Scientific Visualization Studio- Lunar Eclipses and the Moon's Orbit: https://svs.gsfc.nasa.gov/cgi-bin/details.cgi?aid=4158
- NASA Understanding Lunar Eclipses: https://www.youtube.com/watch?v=lNi5UFpales&feature=youtu.be
- NASA Space Place- What causes the seasons? http://spaceplace.nasa.gov/seasons/en/
- Time and Date- Perihelion/Aphelion http://www.timeanddate.com/astronomy/perihelion-aphelion-solstice.html

Benchmark / Summative Assessments

Teacher created
- Model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons
- Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system
- Analyze and interpret data to determine scale properties of objects in the solar system.

• Seasons/ Ecliptic Simulator (Astronomy Education, University of Nebraska) http://astro.unl.edu/naap/motion1/animations/seasons_ecliptic.html?huid=nKdMD0iwvYXZ7i_uAXEEJQ • FOSS Day/ Night Simulator: http://www.fossweb.com/delegate/ssi-foss-ucm/Contribution%20Folders/FOSS/multimedia/Planetary_Science/binders/earth/earth_motions/day_night_simulation_1.html • Reason for Seasons Simulator: http://cimss.ssec.wisc.edu/wxfest/Seasons/seasons.html	

Supports / Modifications for ELLs	Supports / Modifications for Students w/ 504s and or IEPs
• Preview content • Utilize visuals, images, actions, and talk • Scaffold development of comprehension process vocabulary AND content-specific vocabulary • Display anchor charts for language structures • Provide assessments with graphic supports • Utilize prepared sentence stems • Graphic organizers • Flexible grouping • Additional time for processing and assessment	• Differentiate content, process, product, and learning environment • Provide alternative or high interest text at student's reading level. • Provide summaries of materials for student. • Shorten assignments and assessments to focus on mastery of key concepts. • Substitute alternatives for written assignments. • Specify and review often exactly what the student will need to learn to pass. • Modify expectations based on student needs. • Provide a "designated notetaker" or photocopy of other student or teacher notes. • Provide a print copy of assignments or notes. • Go over directions orally. • Provide additional time on tests. • Read test materials to the student, and allow oral responses. • Use enlarged graph paper to write problems to help the student keep numbers in columns. • Break long-term assignments into small steps, with daily monitoring and frequent grading. • Use both oral and printed directions.
Supports / Modifications for At Risk Students	**Supports / Modifications for Gifted & Talented Students**
• Review the classroom rules frequently. • Evaluate classroom structure against the student's needs (flexible structure, firm limits, etc.). • Keep workspace clear of unrelated materials. • Keep classroom quiet during intense learning times. • Reduce visual distractions in the classroom (mobiles, etc.). • Seat the student close to the teacher / instruction, and away from distractions. • Keep extra supplies of classroom materials (pencils, books) on hand. • Alert student several minutes before a transition from one activity to another is planned; give several reminders. • Reinforce (often) when a student displays positive behavior. • Develop an individualized behavior intervention plan that consistent with the student's ability and skills. • Arrange for a student to leave the classroom for a designated "safe place" when highly stressed. • Develop a system or a code word to let a student know when behavior is not appropriate. • Ignore behaviors that are not seriously disruptive.	• Provide opportunities to pursue advanced level work • Expose students to higher level thinking skills • Provide enrichment centers • pursue a self-selected interest • work in groups with students having common interests • move to a higher grade for specific subject area instruction • work with students of comparable ability across classrooms at the same grade level • work on an advanced curriculum unit on a teacher-selected topic • participate in competitive programs focusing on thinking skills/problem solving • receive concentrated instruction in critical thinking and creative problem solving

COURSE/SUBJECT: Science **LEVEL/GRADE**: 6th Grade

UNIT/FOCUS: Weather & Climate **TIMEFRAME:** 7 Weeks

Transfer

Students will be able to independently use their learning to…

- Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5)
- Develop and use a model to describe phenomena. (MS-ESS2-6)
- Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5)

Meaning

Enduring Understandings (EUs)	Essential Questions (EQs)
Students will understand that… • Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2) • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5) • Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6) • Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)	*Students will keep considering…* • How do the properties and movements of water shape Earth's surface and affect its systems? • What regulates weather and climate? • How do people model and predict the effects of human activities on Earth's climate?

Acquisition

Knowledge	Skills
Students will know… • The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5) • Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6) • Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6) • Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5) • The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6) • Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)	*Students will be able to…* • MS-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions • MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. • MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

COURSE/SUBJECT: Science **LEVEL/GRADE**: 6th Grade

Aligned Concepts, Topics, and Skills	Pacing Guide
Topics: • Unequal Heating of Earth's Surface • Weather Factors • Air Masses & Fronts • Storms • Atmosphere & Ocean Circulation • El Nino/ La Nina • Climate Change Natural Phenomenon: • The sky is blue during the day and orange at sunrise and sunset • I feel warmer when I am wearing a dark colored shirt and cooler when wearing a light colored shirt • Aluminum at room temperature feels colder than plastic foam at room temperature • Hot air rises, cold air sinks • At the shore, a sea breeze forms during the day and a land breeze forms at night • Winds blow in predictable patterns at specific latitudes • Water falls from the sky in different forms • Sometimes ice falls from the sky even when it's not winter • Sometimes air feels really wet and my hair gets frizzy! • Sometimes after a thunderstorm it feels nice and cool, but other times it is still hot and humid • High pressure systems bring sunny weather; Low pressure systems bring cloudy weather • Clouds and storms form along a front • Severe storms can be predicted and prepared for • Storms can cause a lot of damage to life and property • Hot water will rise above cold water. Salt water will sink beneath freshwater • Ocean Currents move in predictable directions	• Approximately 7 weeks for unit
21st Century Life and Career Ready Practices	**Interdisciplinary Connections**
• CRP1. Act as a responsible and contributing citizen and employee. • CRP2. Apply appropriate academic and technical skills. • CRP3. Attend to personal health and financial well-being. • CRP4. Communicate clearly and effectively and with reason. • CRP5. Consider the environmental, social and economic impacts of decisions. • CRP6. Demonstrate creativity and innovation. • CRP7. Employ valid and reliable research strategies. • CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. • CRP9. Model integrity, ethical leadership and effective management. • CRP10. Plan education and career paths aligned to personal goals. • CRP11. Use technology to enhance productivity. • CRP12. Work productively in teams while using cultural global competence.	• Science and Engineering Practices • Cross-Cutting Concepts

COURSE/SUBJECT: Science **LEVEL/GRADE**: 6th Grade

Instructional Resources	**Benchmark / Summative Assessments**

• GEMS Ocean Science Systems Grades 6-8 Curriculum- Unit 1: Ocean & Atmosphere Interactions
• MY NASA DATA/ GLOBE Digital Posters: http://mynasadata.larc.nasa.gov/globe/
• Heat, Temperature, and Conduction http://www.middleschoolchemistry.com/lessonplans/chapter2/lesson1
• Convection Experiments- UCAR: https://www.ucar.edu/learn/1_1_2_7t.htm
• Weather WiZ Kids: http://www.weatherwizkids.com/
• NOAA Jetstream- An Online School For Weather: http://www.srh.noaa.gov/jetstream/index.html
• Climate Education for K-12- NC State University: https://climate.ncsu.edu/edu/k12/.fronts
• NWS- National Prediction Center: http://www.wpc.ncep.noaa.gov/
• Weather Underground: https://www.wunderground.com/US/Region/US/2xFronts.html
• EUMETSAT- Monitoring Weather and Climate from Space: http://www.eumetsat.int/website/home/index.html
• NOAA- Science on a Sphere Data Sets: http://sos.noaa.gov/Datasets/dataset.php?id=55
• PBS Learning Media- Compare the Poles: http://www.pbslearningmedia.org/resource/ipy07.sci.life.eco.comparepoles/compare-the-poles/
• Polar Discovery- Antarctica's Ecosystem: http://polardiscovery.whoi.edu/antarctica/ecosystem.html
• National Geographic- Ocean Gyre: http://nationalgeographic.org/encyclopedia/ocean-gyre/
• Woods Hole Oceanographic Institute: http://www.whoi.edu/main/ocean-topics
• NOAA National Weather Service: http://www.weather.gov/
• Wind Chill: http://www.nws.noaa.gov/om/winter/resources/wind-chill-brochure.pdf
• El Nino and La Nina Years and Intensities: http://ggweather.com/enso/oni.htm
• NOAA Hurricane Visualizations: https://www.gfdl.noaa.gov/visualizations-hurricanes/
• Earth- A Global Map of Wind, Weather, and Ocean Conditions: https://earth.nullschool.net/#current/wind/surface/level/orthographic
• AGI Earth Science Week Activities: http://www.earthsciweek.org/big-ideas
• AGI Earth Science Week Videos: https://www.youtube.com/user/AGIeducation/videos
  ○ Big Idea 5: Earth is the Water Planet
  ○ Big Idea 8: Natural Hazards Affect Humans
	Teacher created
	• Use data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions
	• Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
	• Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

Supports / Modifications for ELLs	**Supports / Modifications for Students w/ 504s and or IEPs**
• Preview content • Utilize visuals, images, actions, and talk • Scaffold development of comprehension process vocabulary AND content-specific vocabulary • Display anchor charts for language structures • Provide assessments with graphic supports	• Differentiate content, process, product, and learning environment • Provide alternative or high interest text at student's reading level. • Provide summaries of materials for student. • Shorten assignments and assessments to focus on mastery of key concepts. • Substitute alternatives for written assignments. • Specify and review often exactly what the student will need to learn to pass.

• Utilize prepared sentence stems • Graphic organizers • Flexible grouping • Additional time for processing and assessment	• Modify expectations based on student needs. • Provide a "designated notetaker" or photocopy of other student or teacher notes. • Provide a print copy of assignments or notes. • Go over directions orally. • Provide additional time on tests. • Read test materials to the student, and allow oral responses. • Use enlarged graph paper to write problems to help the student keep numbers in columns. • Break long-term assignments into small steps, with daily monitoring and frequent grading. • Use both oral and printed directions.
Supports / Modifications for At Risk Students	**Supports / Modifications for Gifted & Talented Students**
• Review the classroom rules frequently. • Evaluate classroom structure against the student's needs (flexible structure, firm limits, etc.). • Keep workspace clear of unrelated materials. • Keep classroom quiet during intense learning times. • Reduce visual distractions in the classroom (mobiles, etc.). • Seat the student close to the teacher / instruction, and away from distractions. • Keep extra supplies of classroom materials (pencils, books) on hand. • Alert student several minutes before a transition from one activity to another is planned; give several reminders. • Reinforce (often) when a student displays positive behavior. • Develop an individualized behavior intervention plan that consistent with the student's ability and skills. • Arrange for a student to leave the classroom for a designated "safe place" when highly stressed. • Develop a system or a code word to let a student know when behavior is not appropriate. • Ignore behaviors that are not seriously disruptive.	• Provide opportunities to pursue advanced level work • Expose students to higher level thinking skills • Provide enrichment centers • pursue a self-selected interest • work in groups with students having common interests • move to a higher grade for specific subject area instruction • work with students of comparable ability across classrooms at the same grade level • work on an advanced curriculum unit on a teacher-selected topic • participate in competitive programs focusing on thinking skills/problem solving • receive concentrated instruction in critical thinking and creative problem solving

COURSE/SUBJECT: Science

LEVEL/GRADE: 6th Grade

UNIT/FOCUS: History of the Earth

TIMEFRAME: 7 Weeks

Transfer

Students will be able to independently use their learning to…

- Develop and use a model to describe phenomena. (MSESS2-1) Analyzing and Interpreting Data
- Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3)
- Construct a scientific explanation based on valid and reliable evidence obtained from sources and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MSESS1-4),(MS-ESS2-2)

Meaning

Enduring Understandings (EUs)

Students will understand that…

- Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3)
- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1- 4),(MS-ESS2-2)
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1)
- Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MSESS2-1)

Essential Questions (EQs)

Students will keep considering…

- How do people reconstruct and date events in Earth's planetary history?
- How do Earth's major systems interact?
- Why do the continents move, and what causes earthquakes and volcanoes?
- How do the properties and movements of water shape Earth's surface and affect its systems?
- How do humans depend on Earth's resources?

Acquisition

Knowledge

Students will know…

- The geologic time scale interpreted from rock strata provides a way to organize Earth's history . Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1- 4) Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE) (secondary to MS-ESS2-3)
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)
- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)
- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)
- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)
- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)

Skills

Students will be able to…

- MS-ESS1-4 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
- MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales
- *MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
- MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
- MS-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

COURSE/SUBJECT: Science **LEVEL/GRADE**: 6th Grade

Aligned Concepts, Topics, and Skills	Pacing Guide
Topics: • Geologic Time • Fossil Record • Law of Superposition • Plate Tectonics • Seafloor Spreading • Earthquakes & Volcanoes • Weathering & Erosion • Rock Cycle • Rocks and Mineral Formation • Renewable & Nonrenewable Resources • Law of Uniformitarianism Natural Phenomenon: • More diamonds are mined in Russia and Botswanna than anywhere else on the planet. • Engineering Scenario: Design and construct a building to withstand the shaking of an Earthquake. • The continents look like they fit together like puzzle pieces. • Earthquakes and Volcanoes make a pattern around the world. • My beach got smaller since last summer.	• Approximately 7 weeks for unit
21st Century Life and Career Ready Practices	**Interdisciplinary Connections**
• CRP1. Act as a responsible and contributing citizen and employee. • CRP2. Apply appropriate academic and technical skills. • CRP3. Attend to personal health and financial well-being. • CRP4. Communicate clearly and effectively and with reason. • CRP5. Consider the environmental, social and economic impacts of decisions. • CRP6. Demonstrate creativity and innovation. • CRP7. Employ valid and reliable research strategies. • CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. • CRP9. Model integrity, ethical leadership and effective management. • CRP10. Plan education and career paths aligned to personal goals. • CRP11. Use technology to enhance productivity. • CRP12. Work productively in teams while using cultural global competence.	• Science and Engineering Practices • Cross-Cutting Concepts

COURSE/SUBJECT: Science **LEVEL/GRADE**: 6th Grade

Instructional Resources	Benchmark / Summative Assessments

• IRIS-Incorporated Research Institutes for Seismology-http://www.iris.edu/hq/
  ○ Under Education there are lessons, demos, animations, videos, posters, fact sheets, educational seismographs, visualizations.
• USGS: https://www.usgs.gov/
• Earth Scope: http://www.earthscope.org/
• Dynamic Earth Interactive: http://learner.org/interactives/dynamicearth/tectonicsmap/
• PBS Learning Media: http://www.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.tectonic/tectonic-plates-earthquakes-and-volcanoes/
• Oregon State University- Volcano World: http://volcano.oregonstate.edu/earth-science-lessons
• NOAA- Ocean Explorer- Plate Tectonics: http://oceanexplorer.noaa.gov/edu/learning/player/lesson01.html
• UpSeis: http://www.geo.mtu.edu/UPSeis/waves.html
• USGS Ash Cloud Visualizations: http://volcanoes.usgs.gov/volcanoes/st_helens/monitoring_ash_cloud.html
• Environmental Literacy and Inquiry: http://www.ei.lehigh.edu/eli/tectonics/ (webGIS investigation for Plate Tectonics) *Lehigh provides a final assessment, but you need a password and username. You can find that in NSTA's Science Scope magazine, Dec 2013, vol 37 #4. On page 37 in the conclusion section of the article: "Using web GIS to enhance tectonics learning and geospatial thinking".*
• Continental Drift: https://www.youtube.com/watch?time_continue=3&v=_5q8hzF9VVE
• Discovering Plate Boundaries: http://plateboundary.rice.edu/
  ○ http://nagt.org/nagt/teaching_resources/teachingmaterials/11340.html
  ○ http://serc.carleton.edu/NAGTWorkshops/urban/activities/22207.html
• Interactive Rock Cycle Animation: http://www.classzone.com/books/earth_science/terc/content/investigations/es0602/es0602page02.cfm
• BBC Journey to the Center of the Earth Interactive: http://www.bbc.com/future/bespoke/story/20150306-journey-to-the-centre-of-earth/index.html
• Finding Fossils: http://naturalhistory.si.edu/exhibits/backyard-dinosaurs/finding-fossils.cfm
• NOAA Tsunami: http://www.tsunami.noaa.gov/
• Ready.gov: https://www.ready.gov/tsunamis
• Pacific Tsunami Warning Center: http://ptwc.weather.gov/
• NOAA-National Data Buoy Center: http://www.ndbc.noaa.gov/dart.shtml
• BGS Geologic Timeline: *http://www.bgs.ac.uk/discoveringgeology/time/timeline/teachers_notes.html (for teacher background)*
• National Geographic Prehistoric Timeline: *http://science.nationalgeographic.com/science/prehistoric-world/prehistoric-time-line (for teacher background)*
• USGS- What is Geologic Time?: http://geomaps.wr.usgs.gov/parks/gtime/ (background reading)
• AGI Earth Science Week Activities: http://www.earthsciweek.org/big-ideas
• AGI Earth Science Week Videos: https://www.youtube.com/user/AGIeducation/videos
  ○ Big Idea 2: Earth is 4.6 Billion Years Old
  ○ Big Idea 4: Earth Continually Changes
  ○ Big Idea 7: Earth Provides Resources
  ○ Big Idea 8: Natural Hazards Affect Humans
	Teacher created:
	• A scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
	• An explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales
	• Provide evidence of the past plate motions.
	• A model to describe the cycling of Earth's materials and the flow of energy that drives this process.
	• A scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
	• Forecast future catastrophic events and inform the development of technologies to mitigate their effects.

COURSE/SUBJECT: Science **LEVEL/GRADE**: 6th Grade

Supports / Modifications for ELLs	Supports / Modifications for Students w/ 504s and or IEPs
• Preview content • Utilize visuals, images, actions, and talk • Scaffold development of comprehension process vocabulary AND content-specific vocabulary • Display anchor charts for language structures • Provide assessments with graphic supports • Utilize prepared sentence stems • Graphic organizers • Flexible grouping • Additional time for processing and assessment	• Differentiate content, process, product, and learning environment • Provide alternative or high interest text at student's reading level. • Provide summaries of materials for student. • Shorten assignments and assessments to focus on mastery of key concepts. • Substitute alternatives for written assignments. • Specify and review often exactly what the student will need to learn to pass. • Modify expectations based on student needs. • Provide a "designated notetaker" or photocopy of other student or teacher notes. • Provide a print copy of assignments or notes. • Go over directions orally. • Provide additional time on tests. • Read test materials to the student, and allow oral responses. • Use enlarged graph paper to write problems to help the student keep numbers in columns. • Break long-term assignments into small steps, with daily monitoring and frequent grading. • Use both oral and printed directions.
Supports / Modifications for At Risk Students	**Supports / Modifications for Gifted & Talented Students**
• Review the classroom rules frequently. • Evaluate classroom structure against the student's needs (flexible structure, firm limits, etc.). • Keep workspace clear of unrelated materials. • Keep classroom quiet during intense learning times. • Reduce visual distractions in the classroom (mobiles, etc.). • Seat the student close to the teacher / instruction, and away from distractions. • Keep extra supplies of classroom materials (pencils, books) on hand. • Alert student several minutes before a transition from one activity to another is planned; give several reminders. • Reinforce (often) when a student displays positive behavior. • Develop an individualized behavior intervention plan that consistent with the student's ability and skills. • Arrange for a student to leave the classroom for a designated "safe place" when highly stressed. • Develop a system or a code word to let a student know when behavior is not appropriate. • Ignore behaviors that are not seriously disruptive.	• Provide opportunities to pursue advanced level work • Expose students to higher level thinking skills • Provide enrichment centers • pursue a self-selected interest • work in groups with students having common interests • move to a higher grade for specific subject area instruction • work with students of comparable ability across classrooms at the same grade level • work on an advanced curriculum unit on a teacher-selected topic • participate in competitive programs focusing on thinking skills/problem solving • receive concentrated instruction in critical thinking and creative problem solving

COURSE/SUBJECT: Science

LEVEL/GRADE: 6th Grade

UNIT/FOCUS: Human Impacts

TIMEFRAME: 7 weeks

Transfer

Students will be able to independently use their learning to…

- Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5)
- Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)
- Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)

Meaning

Enduring Understandings (EUs)	Essential Questions (EQs)
Students will understand that… • Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3) • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-4) • Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)	*Students will keep considering…* • How do humans change the planet? • How do people model and predict the effects of human activities on Earth's climate?

Acquisition

Knowledge	Skills
Students will know… • Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3) • Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MSESS3-3),(MS-ESS3-4) • Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)	*Students will be able to…* • MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. • MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. • MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

COURSE/SUBJECT: Science **LEVEL/GRADE**: 6th Grade

Aligned Concepts, Topics, and Skills

Topics:
- Climate Change
- Pollution
- Land Usage

Natural Phenomenon:
- Every year the weatherman says it's the "hottest one on record".
- There are more "high ozone alert" days in the summer.

Pacing Guide

- Approximately 7 weeks for unit

21st Century Life and Career Ready Practices

- CRP1. Act as a responsible and contributing citizen and employee.
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- CRP11. Use technology to enhance productivity.
- CRP12. Work productively in teams while using cultural global competence.

Interdisciplinary Connections

- Science and Engineering Practices
- Cross-Cutting Concepts

Instructional Resources

- Earth: The Operators Manual: http://earththeoperatorsmanual.com/feature-video/earth-the-operators-manual (Video/ video segments about understanding our relationship with fossil fuels)
  - http://earththeoperatorsmanual.com/for_educators (teacher resources)
- National Energy Education Development Project: http://www.need.org/intermediate (Complete curricular resources on everything energy- activities, background readings, labs)
- AGI Earth Science Week Activities: http://www.earthsciweek.org/big-ideas
- AGI Earth Science Week Videos: https://www.youtube.com/user/AGIeducation/videos
  - Big Idea 9: Humans Change the Earth
- Climate Time Machine: http://climate.nasa.gov/interactives/climate-time-machine (Sea ice, sea level, carbon dioxide, global temperature)
- USGS- Regional and Global Climate: http://regclim.coas.oregonstate.edu/visualization/
- NASA Visualization Explorer:
  - It's Hot in Here: http://svs.gsfc.nasa.gov/cgi-bin/details.cgi?aid=11280
  - Enhancing the Extremes: http://svs.gsfc.nasa.gov/cgi-bin/details.cgi?aid=11281
- Wall Street Journal- California's Long Challenge with Drought: http://graphics.wsj.com/californias-long-challenge-with-drought/
- US Drought Portal: https://www.drought.gov/drought/
- Air Pollution in the World (Real-time): https://waqi.info/
- EPA-Air Quality Guide for Ozone: https://airnow.gov/index.cfm?action=pubs.aqiguideozone
- NJDEP- Air Quality Station Data: http://www.njaqinow.net/ (Chester Monitoring Station)
- IDEA (Infusing Satellite Data Into Environmental Applications): http://www.star.nesdis.noaa.gov/smcd/spb/aq/

Benchmark / Summative Assessments

Teacher created
- Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
- Design of a method for monitoring and minimizing a human impact on the environment.
- An argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

- NASA Global Climate Change- Vital Signs of the Planet: http://climate.nasa.gov/climate_resource_center/interactives (quizzes are good hooks)

- Resource Listing for Weather and Climate Instruction - http://www.nssl.noaa.gov/edu/resources
- Science with NOAA Research - www.oar.noaa.gov/k12/
- National Severe Storm Laboratory's Weather Room - www.nssl.noaa.gov/edu/
- EXPLORES! Using Satellite Data - www.met.fsu.edu/explores
- National Climatic Data Center - www.ncdc.noaa.gov/ol/climate/climateextremes.html
- Climate Prediction Center - www.cpc.ncep.noaa.gov/products/outreach/education.html
- Office of Meteorology Publications - www.nws.noaa.gov/om/
- The University of Illinois Online Guides - ww2010.atmos.uiuc.edu/(Gh)/guides/home.rxmlm
- The Societal Aspects of Weather - sciencepolicy.colorado.edu/socasp
- The Automated Weather System Helps Teach Weather in the Classroom - www.aws.com/aws_2001/default.asp

Supports / Modifications for ELLs

- Preview content
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- Display anchor charts for language structures
- Provide assessments with graphic supports
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- Graphic organizers
- Flexible grouping
- Additional time for processing and assessment

Supports / Modifications for Students w/ 504s and or IEPs

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- Provide alternative or high interest text at student's reading level.
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- Modify expectations based on student needs.
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- Provide a print copy of assignments or notes.
- Go over directions orally.
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- Read test materials to the student, and allow oral responses.
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- pursue a self-selected interest
- work in groups with students having common interests
- move to a higher grade for specific subject area instruction
- work with students of comparable ability across classrooms at the same grade level
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- receive concentrated instruction in critical thinking and creative problem solving

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