Willingboro
Public Schools

"Where Excellence is the Expectation"

Geoscience

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From New Jersey Student Learning Standards

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Overview	Content Standards	Science Concepts
Unit 1 **Introduction & Hydrosphere: Water in Earth's Systems**	• HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. • HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. • HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. • HS-ESS2-7: Construct an argument based on evidence about the coevolution of Earth's systems and life on Earth. (Changes in the atmosphere from plants and other organisms along with feedback mechanisms.) • HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. • HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. • HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	• Introduction to Earth's systems; basic requirements for sustaining life • Water cycle; surface water, groundwater, assessing and protecting water supplies • Global patterns of ocean circulation; how wind and density differences drive ocean currents; global conveyor belt; El Niño
Unit 2 **Atmosphere and Climate**	• HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. • HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. • HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. • HS-ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.	• Climate and weather; influence of latitude, atmospheric circulation, proximity to ocean, elevation, land features, and prevailing winds on regional climate • Energy balance, albedo effect, greenhouse effect, carbon cycle, positive and negative feedback loops • Paleoclimatology, climate proxies, climate change in Earth's past, Milankovitch cycles, tectonic processes that influence climate, human impact on climate

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Overview	Content Standards	Science Concepts
	• HS-ESS2-7: Construct an argument based on evidence about the coevolution of Earth's systems and life on Earth. (Changes in the atmosphere from plants and other organisms along with feedback mechanisms.) • HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. • HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. • HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.	
Unit 3 **Mid-Year Challenge & Earth's Place in the Universe**	• HS-ESS1-1: Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. • HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. • HS-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements. • HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. • HS-ESS1-6: Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. • HS-ESS2-1: Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. • HS-ESS2-3: Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.	• Synthesis of concepts learned in the first part of the course • Solar system formation, Kepler's Laws, radioactive dating, life cycle of stars, spectroscopy • Earth's interior structure and composition, internal sources of heat energy, seismic waves, introduction to plate tectonic theory, driving forces of plate movement
Unit 4	• HS-ESS1-5: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.	• Transform-fault boundaries, earthquakes, physical and computer models, earthquake forecasting

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Overview	Content Standards	Science Concepts
Plate Tectonics	• HS-ESS2-1: Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. • HS-ESS2-3: Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. • HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	• Subduction zones, volcanoes and types of volcanic eruptions, technologies for volcano monitoring, data analyses • Seafloor spreading, paleomagnetism, plate tectonics summary, landforms associated with plate boundaries
Unit 5 **The Rock Cycle**	• HS-ESS1-5: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. • HS-ESS1-6: Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. • HS-ESS2-1: Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. • HS-ESS2-7: Construct an argument based on evidence about the coevolution of Earth's systems and life on Earth. (Changes in the atmosphere from plants and other organisms along with feedback mechanisms.) • HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. • HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	• Erosion and deposition, deltaic processes, formation of sedimentary rock • The nature of rocks and minerals, rock cycle, relative dating, Earth's history
Unit 6 **Earth's Resources & Final Challenge**	• HS-ESS2-7: Construct an argument based on evidence about the coevolution of Earth's systems and life on Earth. (Changes in the atmosphere from plants and other organisms along with feedback mechanisms.) • HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	• The geologic processes by which mineral ores are formed, mineral prospecting, mineral extraction and processing. • Fossil fuel formation, petroleum resources and exploration technologies • Synthesis of concepts learned

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Overview	Content Standards	Science Concepts
	• HS-ESS3-2: Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost benefit ratios. • HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. • HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	
Suggested Open Educational Resources	• The Concord Consortium: Earth Science Resources • National Park Service: Geoscience Teaching Resources • American Geoscience Institute • 20 SEL Activities for High School **(SEL)** • Black History Month: Making History in the Geosciences **(Amistad)** • Diversifying the Geosciences **(DEI)** • Creating Spaces for Geoscientists with Disabilities to Thrive **(Disabilities Awareness/DEI)** • Why discuss disability in the geosciences? **(Disabilities Awareness/DEI)** • Being LGBT in Geoscience Is like Being Invisible **(LGBTQ Mandate)** • Pioneering study of LGBTQ experience in the geosciences finds difficulties, dangers in field **(LGBTQ Mandate)** • Lab-Aids	

Unit 1: Introduction & Hydrosphere: Water in Earth's Systems

Overview

Geoscience is a course focusing on the study of space, geologic structures and forces, the waters on our planet, and the atmospheric forces that shape our world. Students will explore the Earth's spheres including the geosphere, hydrosphere, cryosphere, atmosphere, and the cycles of the Earth such as the water and carbon cycle. Students will learn about scientific inquiry, geologic time, space exploration, the solar system, and the universe.

Upon completion of the course, students will be sensitized to various moral and environmental issues being brought to the fore by research of the universe and other areas of earth and space science.

Essential Questions	Enduring Understandings
• How can recognizing and understanding feedback and patterns help us to investigate the mechanics of Earth's dynamic systems? • How does an understanding of Earth's history enable us to make predictions about its future? • What special features and unique properties make Earth suitable for life, and how do these features and properties differ from those of planets that cannot support life? • In what ways are Earth's dynamic systems an example of the scientific principle of interdependence? • How does matter and energy circulate through Earth's systems and biogeochemical cycles?	• Earth consists of four major systems—the geosphere (solid Earth), hydrosphere (water), atmosphere (air), and biosphere (life). Interactions among these systems create the conditions that exist on Earth and make life on this planet possible. • Other planets such as Mars are not as hospitable to life as Earth. For example, Earth has a thick oxygen-rich atmosphere that provides breathable air, comfortable temperatures, and protection from space radiation. Earth also has liquid water, an essential requirement for life. • Water, due to its abundance and unique qualities, is central to Earth's dynamics and to human survival. • There are many potential pathways a molecule of water can take through the hydrosphere and into and out of freshwater reservoirs that humans can use. • Communities most often obtain their water from surface-water supplies such as rivers, or lakes, or from groundwater aquifers. • The amount of surface and groundwater available in a given area is a function of climate (the amount of rainfall and evaporation rates), the size of the watershed, and the rate at which freshwater resources are used by people. • A variety of technologies help communities obtain and store valuable freshwater, such as groundwater pumping wells, dams used to create artificial reservoirs along rivers, and desalination plants. • There are a number of ways that water supplies can be threatened: as a result of drought, population growth, and failure to protect water supplies from contamination. • Students understand that the water in Earth's oceans is continually circulating in ocean currents, which carry water from one area of an ocean to another. • Students understand that the flow of ocean currents follows predictable patterns. For example, in each major ocean basin, currents flow in circular gyres.

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	• Students understand that the uneven heating of Earth by the Sun provides the energy that drives the ocean currents. Movements of the air in the atmosphere and water in the oceans redistribute heat from the equator toward the poles. • Students know that wind is the primary driving force of surface currents. Once set in motion, the direction of a current is affected by Earth's rotation (the Coriolis effect) and the position of continents. • Students know that it is primarily density differences that drive deep ocean currents. These density differences are related to variations in temperature and salinity of the ocean water. • Students know that currents have a significant effect on the climate of the continents they flow past. • Students know that changes in the flow patterns of ocean currents, for example, during El Niño events, can significantly alter regional and global climate, and have far-reaching effects on Earth's biosphere.

Unit 1: Introduction & Hydrosphere: Water in Earth's Systems

Performance Expectations

- HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
- HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
- HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
- HS-ESS2-7: Construct an argument based on evidence about the coevolution of Earth's systems and life on Earth. (Changes in the atmosphere from plants and other organisms along with feedback mechanisms.)
- HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
- HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Core Ideas

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes.
- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.
- Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. (secondary)
- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles.

Unit 1: Introduction & Hydrosphere: Water in Earth's Systems

Performance Expectations

- The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks.
- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.
- The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it.
- Resource availability has guided the development of human society.
- Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations.
- The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources.
- Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.
- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.

Student Learning Objectives

Students will be able to:

- Read an excerpt from a science fiction story about Mars colonists and analyze the resources necessary to sustain human populations on this neighboring planet.
- Learn about droughts in Texas and Tennessee, and consider how access to plentiful and clean water is critical to human survival.
- Build their knowledge about how water is obtained by reviewing the water cycle and learning the science behind surface and groundwater supplies.
- Research case studies from communities around the world, they get up close and personal, evaluating where their water comes from and whether their supply could be threatened in the future.
- Read a true story about Thor Heyerdahl, the explorer who set sail across the Pacific in the primitive raft Kon-Tiki to prove a theory. Drifting on an ocean current, he sought to show that people from South America could have migrated to Polynesia over 1,000 years ago without the benefit of developed seafaring vessels.
- Gather knowledge about the science of ocean currents to decide whether his idea was crazy or had a chance of success.
- Describe Earth's systems and give examples of how interactions among these systems create the conditions that exist on Earth
- Describe key differences between Earth and Mars, specifically comparing aspects of the geosphere, atmosphere, hydrosphere, and biosphere of the two planets
- Recognize and discuss the idea that humans are adapted to the unique conditions on Earth and that these conditions would be very difficult to reproduce on another planet.

Integrated Accommodations and Modifications		
Special Education Students	**English Language Learners**	**At Risk**

• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	**504 Plan**
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments

Interdisciplinary Connections	Computer Science and Design Thinking
Math ● HSS.IC.A.1: Understand statistics as a process for making inferences about population parameters based on a random sample from that population. ● HSS.IC.B.5: Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. ● HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ● HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. ● HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ● HSA-SSE.A.1 Interpret expressions that represent a quantity in terms of its context. ● HSA-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. ● HSA.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. **English Language Arts** Reading ● RST.9-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. Writing ● WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ● WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. ● WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. ● WHST.9-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas,	**Computer Science and Design Thinking Practices** 1. ☐ Fostering an Inclusive Computing and Design Culture 2. ☑ Collaborating Around Computing and Design 3. ☐ Recognizing and Defining Computational Problems 4. ☐ Developing and Using Abstractions 5. ☐ Creating Computational Artifacts 6. ☐ Testing and Refining Computational Artifacts 7. ☑ Communicating About Computing and Design **Computer Science and Design Thinking Standards** ● 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. ● 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. ● 8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices. ● 8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources. **Core Ideas** ● Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information. ● The accuracy of predictions or inferences made from a computer model is affected by the amount, quality, and diversity of data. ● The design and use of computing technologies and artifacts can positively or negatively affect equitable access to information and opportunities.

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avoiding plagiarism and overreliance on any one source and following a standard format for citation. ● WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.	

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community member and employee.
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Use technology to enhance productivity, increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1)
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).
- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

Formative Assessment Plan	Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* ● **Activities:** ○ **Survival on Earth and Mars**

Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: ● Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) ● Exit tickets, rotational activities (stations), quizzes, and small group activities ● Classwork, homework, group work ● Pre-Assessments, teacher's observation, class discussion, and journal ● Journal Writing ● Daily Verbal Assessments; probing student's understanding ● Brainstorming ● Sharing Ideas; providing students' feedback ● Discussions ● Quizzes	○ **Reservoir Roulette** ○ **Where's the Drinking Water** ○ **Water Supply Case Studies** ○ **Follow the Flow: Researching Your Water Supply** ○ **The Effect of Wind on Ocean Currents** ○ **Natural Patterns** ○ **The Effect of Density on Ocean Currents** ● **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module test or constructed responses) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

Earth's systems, biosphere, geosphere, atmosphere, cryosphere, water cycle, ground water, aquifer, circulation, density, ocean currents, conveyor belt, transpiration, evaporation, sublimation, condensation, infiltration, precipitation, run-off, groundwater, coalescence, surface water, rain, sleet, snow, ice caps, hail, percolation, reservoir, water vapor, glacier

Resources:

- Science News
- Science Friday PBS
- Earth Science Exploration | PBS LearningMedia
- Teach The Earth: Water Footprint

Pacing Guide

Can be found within Lab-Aids.

Unit 2: Atmosphere and Climate

Overview

Geoscience is a course focusing on the study of space, geologic structures and forces, the waters on our planet, and the atmospheric forces that shape our world. Students will explore the Earth's spheres including the geosphere, hydrosphere, cryosphere, atmosphere, and the cycles of the Earth such as the water and carbon cycle. Students will learn about scientific inquiry, geologic time, space exploration, the solar system, and the universe.

Upon completion of the course, students will be sensitized to various moral and environmental issues being brought to the fore by research of the universe and other areas of earth and space science.

Essential Questions	Enduring Understandings
● What are the specific ways in which human activity is affecting climate change? ● How can we develop solutions within the human domain for problems related to climate change? ● What are the political, socio-economic, and ethical dimensions involved in understanding the relationship between human activity and climate change? ● What is the difference between climate and weather? ● How does the sun affect weather patterns on Earth? ● How is climate changing over time, and to what extent are humans impacting the change? ● What can be done to reduce the effects of climate change? ● How do different parts of the Earth's climate system affect one another? ● In what ways does temperature affect climate? ● How and to what extent can we predict the weather? ● How do we collect data about the weather?	● Students know that climate is defined as a long-term (30 years or more) average of weather conditions of a place or area. Climate is measured primarily in terms of temperature and precipitation, although scientists also track other components of weather. ● Students know that the climate conditions of a region have a profound effect on the plants and animals that live there. Organisms have evolved a wide variety of adaptations that enable them to survive in their particular climate. ● Students know that the uneven heating of Earth causes temperatures to generally be higher at lower latitudes. Convecting air masses within the atmosphere play a significant role in redistributing this heat from the equator toward the poles. Patterns of rising and sinking air in each convection cell create wet and dry areas on Earth’s land surfaces. ● Students know that interactions between the oceans and land have a significant impact on regional climate as well. Warm and cold ocean currents flowing along the margins of continents affect temperatures in coastal cities. Because water has a higher heat capacity than land, the climate in coastal cities is generally more moderate than that of inland cities with greater temperature extremes in inland areas. ● Students know that the direction of prevailing winds is also important to regional climate. If the prevailing winds in a particular area flow toward that area from a water body, the area is more likely to have a relatively wet climate. On the other hand, if the winds blowing into an area come from the interior of a continent, the climate is more likely to be dry. ● Students know that the elevation of an area affects its temperature, and the presence of mountains can affect precipitation patterns in an area. ● Students know that Earth’s climate system is driven primarily by energy received from the Sun in the form of light energy, or electromagnetic radiation. Some of this energy is absorbed by the clouds and Earth’s surface, and some is reflected back into space. ● Students know that most of the light energy that is absorbed by Earth’s surface is reradiated as longer-wavelength heat energy. Certain gases in Earth’s atmosphere, called greenhouse gases, trap the longer-wavelength heat energy, which warms Earth. Without this greenhouse effect, Earth would not be habitable. ● Students know that the level of greenhouse gases in the atmosphere affects Earth’s temperature. As the concentrations of these gases increase, Earth’s average temperature increases.

	• Students know that another factor that influences Earth's temperature is the albedo effect. Albedo is a measure of the percentage of incoming light energy that is reflected. As Earth's albedo changes—the amount of heat energy absorbed versus reflected changes—the temperature at Earth's surface rises and falls. This causes regional, seasonal, and long-term global changes in Earth's temperature. • Students understand the major processes by which carbon moves from one reservoir to another in Earth's carbon cycle and how these processes affect the level of CO2 in the atmosphere. • Students understand that Earth's climate system is affected by negative and positive feedback loops. Negative feedbacks have a stabilizing effect and tend to keep conditions the same. Positive feedbacks are destabilizing and tend to accelerate changes in conditions. • Students understand that Earth's climate has changed dramatically in the past. • Students know that scientists investigate Earth's climate history by studying records of past climates stored in tree rings, coral, rocks, sediment, and ice, as well as more recent human records of weather data. • Students know that periodic changes in the tilt of Earth as well as its orbit have caused changes in the distribution of solar input, which has affected global climate in the past. • Students know that historical fluctuations in global average temperature have corresponded with fluctuations in atmospheric CO2 levels, related to factors such as the movement of tectonic plates over millions of years. • Global climate models predict that temperatures will continue to rise, and that the amount of temperature change predicted is related to future CO2 emissions. These temperature increases are already causing sea level rise, the melting of glacial and polar ice, and changes in precipitation and ocean acidity. Students know that CO2 increases over the past 100 years are largely attributable to human activities.

Unit 2: Atmosphere and Climate

Performance Expectations

- HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
- HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
- HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
- HS-ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
- HS-ESS2-7: Construct an argument based on evidence about the coevolution of Earth's systems and life on Earth. (Changes in the atmosphere from plants and other organisms along with feedback mechanisms.)

Unit 2: Atmosphere and Climate

Performance Expectations

- HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
- HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
- HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Core Ideas

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes.
- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.
- Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes.
- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles.
- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.
- The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks.
- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.
- Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.
- The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it.
- The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources.
- Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.
- Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. (secondary)
- Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities.

Student Learning Objectives

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Students will be able to:

- Start their exploration of climate close to home, learning about the climate in their local area and comparing it to a chosen travel destination.
- Learn how climate is measured and how it affects the flora and fauna of a landscape.
- Investigate key factors that cause climate to vary so much around the world.
- Read about a community in Alaska that is threatened by climate change and research the factors that influence global climate and can cause it to change.
    - Consider whether members of the Alaskan community should move or stay, and prepare recommendations to share at a public meeting.
- Explore two time periods in Earth's past when climate was very different from today—the warm Cretaceous and a glacial interval of the Pleistocene.
- Study evidence—recorded in sediments, rocks, and ice—that climate has varied through Earth's history, and explore the factors that have contributed to these changes.
- Look at evidence that Earth's climate is changing now and how human activity and natural factors contribute to this change.

Integrated Accommodations and Modifications

Special Education Students	English Language Learners	At Risk
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills.	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments.

• Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments
Interdisciplinary Connections	**Computer Science and Design Thinking**
Math • HSN.Q.A.2: Define appropriate quantities for the purpose of descriptive modeling. **English Language Arts** Reading • RST.9-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. Writing • WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. • WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. • WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**Computer Science and Design Thinking Practices** 1. ☐ Fostering an Inclusive Computing and Design Culture 2. ☑ Collaborating Around Computing and Design 3. ☐ Recognizing and Defining Computational Problems 4. ☐ Developing and Using Abstractions 5. ☐ Creating Computational Artifacts 6. ☐ Testing and Refining Computational Artifacts 7. ☑ Communicating About Computing and Design **Computer Science and Design Thinking Standards** • 8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers. • 8.2.12.ED.4: Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience. **Core Ideas** • Engineering design is a complex process in which creativity, content knowledge, research, and analysis are used to address local and global problems.

	• Decisions on trade-offs involve systematic comparisons of all costs and benefits, and final steps that may involve redesigning for optimization.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community members and employee
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
- 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

District/School Formative Assessment Plan	District/School Summative Assessment Plan

Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.
 	
Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods:
 	
• Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy)
• Exit tickets, rotational activities (stations), quizzes, and small group activities
• Classwork, homework, group work
	Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.
	
	• **Activities:**
	  ○ **Looking at Climate Data**
	  ○ **Observing Landscapes**
	  ○ **Looking for Patterns in a World Climates Map**
	  ○ **Interactions Between Ocean and Atmosphere**
	  ○ **The Greenhouse Effect**
	  ○ **The Albedo Effect**

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• Pre-Assessments, teacher's observation, class discussion, and journal • Journal Writing • Daily Verbal Assessments; probing student's understanding • Brainstorming • Sharing Ideas; providing students' feedback • Discussions • Quizzes	○ **Moving Carbon Around** ○ **Calling All Carbons** ○ **Looking for Clues to the Past** ○ **Using Climate Proxies** ○ **Investigating How Orbital Changes Have Affected Past Climate** ○ **What's Happening Now and What's Projected for the Future?** ○ • **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module test or constructed responses) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.
Targeted Academic Vocabulary	
Climate, Weather, Latitude, Atmospheric Circulation, Elevation, Prevailing Winds, Albedo Effect, Greenhouse Effect, Carbon Cycle, Positive Feedback Loop, Negative Feedback Loop, Paleoclimatology, Climate Proxies, Milankovitch Cycles	

Resources:
• The Rise of Oxygen in the Earth's Atmosphere, Ninth Grade, Tenth Grade Reading Passage (readworks.org) • Earth Science in Action | Solutions – Climate Change: Vital Signs of the Planet (nasa.gov) **(Climate Change)** • Earth's Changing Climate | National Geographic Society **(Climate Change)** • Climate Change: Science and Impacts Factsheet | Center for Sustainable Systems (umich.edu) **(Climate Change)** • University Corporation for Atmospheric Research
Pacing Guide
Can be found within LabAids.

Unit 3: Mid-Year Challenge & Earth's Place in the Universe

Overview
Geoscience is a course focusing on the study of space, geologic structures and forces, the waters on our planet, and the atmospheric forces that shape our world. Students will explore the Earth's spheres including the geosphere, hydrosphere, cryosphere, atmosphere, and the cycles of the Earth such as the water and carbon cycle. Students will learn about scientific inquiry, geologic time, space exploration, the solar system, and the universe. Upon completion of the course, students will be sensitized to various moral and environmental issues being brought to the fore by research of the universe and other areas of earth and space science.

Essential Questions	**Enduring Understandings**

• How old is Earth, and how do we know? • What is out there (space) and how do we know? • How do the stars we see in our night sky form? • How are stars similar and different from the Sun? • How do scientists determine the chemical compositions of the planets and stars? • Why are Kepler's Laws significant in the growth of science? • What do Kepler's Laws of Planetary Motion tell us about the orbit of a planet? • How do scientists learn about Earth's interior? • What are the features of Earth's crust, core, and mantle? • How does the Sun's energy drive convection within the atmosphere and oceans, producing winds and ocean currents? • How is the epicenter of an earthquake determined?	• Radioactive dating techniques are used to determine the age of Earth and the solar system. • The creation of heavy elements and planet formation are linked to the life cycles of stars. • How to recognize the observable physical and dynamical properties of the solar system, and that a successful theory for the formation of the solar system must explain these patterns. • The current theory for the formation of the solar system—the solar nebula condensation theory. • Kepler's laws of motion for orbiting bodies. • Spectroscopy is used to identify chemical elements in stars. • Earth is made of rocky material, and its interior can be divided into three major layers based on chemical composition—the crust, the mantle, and the core. • The crust and upper-most part of the mantle are relatively cool and rigid, and are also called the lithosphere. This lithosphere is the plate of plate tectonic theory. The plates move on the hotter, more plastic asthenosphere, which lies within the mantle below. • Most of Earth is solid; however, the outer core is liquid (molten metallic material). • Evidence indicates that Earth's layers formed early in the solar system's history when Earth's interior was still molten. The process of gravitational differentiation caused heavy metals to sink inward to form the core and lighter, less dense materials to float toward the surface to form the crust. • Temperature and pressure increase with depth within Earth. • There are two sources of heat energy in Earth's interior: heat left over from impacts during the early history of the solar system and heat generated by the decay of radioactive isotopes in crust and mantle rocks. • Heat is transferred from Earth's interior toward the surface primarily through convection within the mantle. This convection occurs very slowly through the gradual movement of solid rock. This convection is believed to be a primary cause of the movement of tectonic plates on Earth's surface. • Seismic waves from earthquakes travel great distances through Earth and can be detected by seismographs at locations around the world. Because these seismic waves behave differently in different types of materials, they reveal information about the materials that make up Earth's interior. These seismic waves can also be used to locate an earthquake's epicenter.

Unit 3: Mid-Year Challenge & Earth's Place in the Universe

Content Standards

- HS-ESS1-1: Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
- HS-ESS1-2: Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
- HS-ESS1-3: Communicate scientific ideas about the way stars, over their life cycle, produce elements.
- HS-ESS1-4: Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
- HS-ESS1-6: Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
- HS-ESS2-1: Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
- HS-ESS2-3: Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.

Core Ideas

- The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years.
- Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation.
- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth.
- The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe.
- Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode.
- Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities.
- Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system.
- Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history.
- Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. (secondary)
- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes.
- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust.
- Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior.

Unit 3: Mid-Year Challenge & Earth's Place in the Universe

Content Standards

- The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection.
- Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet.

Student Learning Objectives

Students will be able to:

- Use the knowledge they have gained during the first semester of this course to make predictions about what Earth will be like in the year 2100.
  - Communicate their predictions in a news broadcast from the future.
- Explore Earth's place in the universe by investigating how planets and solar systems form as part of the life cycles of stars.
- Gather evidence for the solar nebular theory from the observable patterns of motion in the solar system.
- Learn about methods for dating the age of Earth and other solar system objects.
- Investigate planets, asteroids, comets, and other solar system neighbors, and compare different models that account for the birth of the solar system and the life and death of stars.
- Learn about Kepler's Laws of Motion and investigate the geometry of movement of orbits.
- Conduct a mock trial to examine evidence for the solar nebular condensation theory, and examine line spectra used by astronomers to investigate the composition of objects located many light years from Earth.
- Begin their exploration of the geosphere by looking down at their feet and wondering what lies below them.
  - If they could dig through the floor, through the foundation of their building, through the soil and rocks, and keep going and going, what would they see? They explore Earth's internal structure, as well as the movements and changes that occur within the planet that have a profound effect on Earth's surface.
  - Ultimately, students synthesize their understanding of Earth's interior by creating a "journey" into the earth, communicating scientific information about what they would encounter along the way.

Integrated Accommodations and Modifications

Special Education Students	English Language Learners	At Risk
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes

• Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed	• Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments

Interdisciplinary Connections	Computer Science and Design Thinking
Math • HSF-BF.A.1: Write a function that describes a relationship between two quantities. • HSS.IC.A.1: Understand statistics as a process for making inferences about population parameters based on a random sample from that population. • HSS.IC.B.5: Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	**Computer Science and Design Thinking Practices** 1. □ Fostering an Inclusive Computing and Design Culture 2. ☑ Collaborating Around Computing and Design 3. □ Recognizing and Defining Computational Problems 4. □ Developing and Using Abstractions 5. □ Creating Computational Artifacts 6. □ Testing and Refining Computational Artifacts

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English Language Arts

Reading

- RST.9-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.

Writing

- WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WHST.9-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

Speaking and Listening

- SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

7. ☑ Communicating About Computing and Design

Computer Science and Design Thinking Standards

- 8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
- 8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.
- 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
- 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

Core Ideas

- The design and use of computing technologies and artifacts can positively or negatively affect equitable access to information and opportunities.
- Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information.
- The accuracy of predictions or inferences made from a computer model is affected by the amount, quality, and diversity of data.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community members and employee
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1)
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).
- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task (e.g., W.11-12.6.).
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards. Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: ● Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) ● Exit tickets, rotational activities (stations), quizzes, and small group activities ● Classwork, homework, group work	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* ● **Mid-Year Challenge** ● **Activities:** ○ **The "Dating" Game** ○ **Solar System Census** ○ **Model of a Spinning Nebula** ○ **Explaining Patterns with Kepler's Laws of Motion** ○ **Spectroscopy**

• Pre-Assessments, teacher's observation, class discussion, and journal • Journal Writing • Daily Verbal Assessments; probing student's understanding • Brainstorming • Sharing Ideas; providing students' feedback • Discussions • Quizzes	○ **Modeling Earth's Interior Structures** ○ **See What You Can't See** ○ **Body Waves** ○ **Locating an Earthquake Epicenter** • **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

interstellar, Kepler's Laws, radioactive dating, nebula, star, supernova, Red Giant, blackhole, spectroscopy, crust, core, mantle, celestial bodies, dwarf planets, dwarfs, seismic waves, ridge push, slab pull, galaxies

Resources:

- Kepler's Three Laws
- Life Cycle of a Star
- Stanford Solar Center

Pacing Guide

Can be found within LabAids.

Unit 4: Plate Tectonics

Overview

Geoscience is a course focusing on the study of space, geologic structures and forces, the waters on our planet, and the atmospheric forces that shape our world. Students will explore the Earth's spheres including the geosphere, hydrosphere, cryosphere, atmosphere, and the cycles of the Earth such as the water and carbon cycle. Students will learn about scientific inquiry, geologic time, space exploration, the solar system, and the universe.

Upon completion of the course, students will be sensitized to various moral and environmental issues being brought to the fore by research of the universe and other areas of earth and space science.

Essential Questions	Enduring Understandings
• How can one explain and predict interactions between Earth materials and within Earth systems? • Where are the major earthquakes producing faults in our region? • What causes earthquakes and how do they affect Earth's surface? • How are earthquakes and the destruction they cause measured?	• Field observations, such as displaced surface features and global-positioning-system measurements, provide evidence of horizontal plate movement at slow, but measurable rates along transform plate boundaries, such as the San Andreas fault system

● How accurately can we predict these events? ● How do volcanoes form and how can they be classified? ● What kinds of features form as the result of igneous activity within Earth? ● How does the internal structure of the Earth affect the movement of Earth's crust to create land features? ● What evidence supports the theory of continental drift? ● What are rift valleys and what is their connection to plate tectonics?	● Most earthquakes occur along the boundaries of the tectonic plates, where plates are moving toward each other (convergent boundaries), moving away from each other (divergent boundaries), or sliding past each other (transform boundaries). ● Earthquakes occur along faults, where stress builds up in rock until it ruptures suddenly. Earthquakes vary in intensity. The Richter scale of earthquake magnitude is a logarithmic scale commonly used to describe the size of an earthquake. ● Physical and computer models are important tools for gaining a better understanding of earthquakes. Physical models can be used to better understand the type of motion that occurs along faults and how this motion produces earthquakes. Computer models can simulate complex fault systems and project faults' behaviors over long periods of time. Models can also help assess the amount of damage that will occur to surface structures when earthquake waves through different types of soil and bedrock materials. ● Predicting exactly when and where earthquakes will occur is not possible and that other strategies, such as engineering buildings to withstand them, are a better approach for saving lives. ● Volcanoes occur where magma from Earth's mantle moves to the surface. Many volcanoes are associated with convergent boundaries, where two tectonic plates are moving toward each other. ● Subduction zones occur along convergent boundaries, where one plate (the one composed of denser rock) is pushed beneath the other and descends into the mantle. As the plate descends, water expelled from the plate changes the melting point of surrounding mantle rock, and mantle rock melts, forming magma. ● Patterns in the distribution of earthquake hypocenters along convergent boundaries reveal the subsurface structure of subduction zones. ● Magma is a complex mixture with gases dissolved in it. As magma moves toward the surface, the pressure on the magma decreases and gas comes out of solution. Eruptions along subduction zones tend to be more explosive than those in Hawaii or along divergent boundaries, and form more steep-sided stratovolcanoes. ● Magma forms near a subducting plate rises toward the surface because it is less dense than the surrounding rock. Some of this magma erupts, and a line of volcanoes forms on the surface that parallels the plate boundary. ● Scientific measurements of earthquake activity, ground deformation, and gas emissions can be used to monitor the movement of magma beneath the surface and to predict when a volcano is likely to erupt. ● Multiple interacting factors that cause a volcanic eruption and make it difficult to predict exactly when an eruption will occur.

	• The study of volcanic deposits in the vicinity of a volcano provides evidence of its eruptive history. • Volcanoes are not the only surface feature that typically forms along subduction zones. Deep ocean trenches and folded mountains also form as two plates collide and the lithosphere crumples and thickens. • Scientists, such as Alfred Wegener, envisioned that continents had changed their positions, this theory wasn't widely accepted until new technologies emerging after WW II allowed scientists to begin studying the features on the ocean floor. Using these new data, scientists pieced together the processes of plate tectonics. • Maps of the ocean floor show in the middle of the oceans long volcanic mountain ranges with rift valleys where new crust is forming. • As new crust forms along a ridge the crust (and lithosphere) on either side of the ridge moves apart like conveyor belts. Students understand that Earth's oceanic crust is continually recycled through the process of plate tectonics. Oceanic crust is consumed in subduction zones along convergent boundaries, and new crust is formed at seafloor spreading centers along divergent boundaries. • Rift valleys can also form on continents at young divergent boundaries. Eventually, these continental rift valleys might lead to the formation of new oceans. • The processes that occur along convergent, transform, and divergent boundaries, the physical features that form along each type of boundary, and why volcanic activity and earthquakes are associated with plate movements. • Major scientific theories, such as the plate tectonics theory, are developed and tested by many scientists over many years, based on multiple lines of evidence, before they become accepted by the scientific community.

Unit 4: Plate Tectonics

Performance Expectations

- HS-ESS1-5: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
- HS-ESS2-1: Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
- HS-ESS2-3: Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
- HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

Core Ideas

Unit 4: Plate Tectonics

Performance Expectations

- Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old.
- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history.
- Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust.
- Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials.
- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes.
- Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior.
- The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection.
- Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet.
- Resource availability has guided the development of human society.
- Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations.

Student Learning Objectives

Students will be able to:

- Read about the 1906 San Francisco earthquake and study the relationship of this event to the transform-fault boundary along the west coast of California.
- Use global-positioning-system (GPS) data to track plate motions, build a physical model to understand movements along the fault, and study computer models scientists use to forecast when and where earthquakes will occur.
- examine the relationship of the Cascade volcanoes in Washington, Oregon, and California to the subduction zone along the Northwest coast.
- Plot earthquake data to delineate a subduction zone and learn how scientists monitor changes beneath a volcano that may signal an imminent eruption.
- Apply information about the eruptive histories of the Cascade volcanoes, combined with current monitoring data, to assess the risk associated with living near volcanoes such as Mount Rainier.
- Explore the process of seafloor spreading occurring along the Mid-Atlantic Ridge, looking for patterns in maps of earthquake distribution, seafloor topography, ocean crust age, and paleomagnetic data.
- Pull together what they've learned about plate tectonic processes that occur along divergent, convergent, and transform-plate boundaries.

Integrated Accommodations and Modifications		
Special Education Students	**English Language Learners**	**At Risk**
• Utilize modifications & accommodations delineated in the student's IEP	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors	• Pair visual prompts with verbal presentations

• Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed	• Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments

Interdisciplinary Connections	Computer Science and Design Thinking
English/Language Arts	**Computer Science and Design Thinking Practices** 1. □ Fostering an Inclusive Computing and Design Culture

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Reading

- RST.9-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.

Writing

- WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WHST.9-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

2. ☑ Collaborating Around Computing and Design
3. □ Recognizing and Defining Computational Problems
4. □ Developing and Using Abstractions
5. □ Creating Computational Artifacts
6. □ Testing and Refining Computational Artifacts
7. ☑ Communicating About Computing and Design

Computer Science and Design Thinking Standards

- 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
- 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
- 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
- 8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
- 8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.

Core Ideas

- Individuals select digital tools and design automated processes to collect, transform, generalize, simplify, and present large data sets in different ways to influence how other people interpret and understand the underlying information.
- Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information.
- The accuracy of predictions or inferences made from a computer model is affected by the amount, quality, and diversity of data.
- The design and use of computing technologies and artifacts can positively or negatively affect equitable access to information and opportunities.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community members and employee
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1)
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).
- 9.4.12.DC.8: Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection.
- 9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
- 9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2)
- 9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task (e.g., W.11-12.6.).
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.*

Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods: ● Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy) ● Exit tickets, rotational activities (stations), quizzes, and small group activities ● Classwork, homework, group work ● Pre-Assessments, teacher's observation, class discussion, and journal ● Journal Writing ● Daily Verbal Assessments	● **Activities:** ○ **Using GPS Data and Geologic Markers to Track Plate Motion** ○ **Looking for Patterns in a World Map** ○ **What is Happening along the San Andreas Fault?** ○ **Studying Earthquake Computer Models** ○ **Detecting a Subducting Plate** ○ **A Lava Flow or an Explosion** ○ **What Might an Eruption of Rainier Be Like?** ○ **How do Scientists Monitor Volcanoes?** ○ **Monitoring Mount Rainier** ○ **Features Along Convergent Boundaries** ○ **Using Sound Waves to Map an Ocean Floor** ○ **Studying Maps of Earth's Oceans** ○ **Plotting a Magnetic Map of the Ocean** ○ **How Are Ocean Basins Formed by Seafloor Spreading?** ● **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

Transform fault boundaries, subduction zones, seafloor spreading, paleomagnetism, GPS, seafloor topography, divergent boundaries, convergent boundaries, transform-plate boundaries, collision zone, continental crust, oceanic crust, rift, P-waves, S-Waves, seismograph, Richter Scale, Radius, wave

Resources:

- Karst Topography and Mammoth Cave | PBS LearningMedia
- Gladys West, The Black Woman Who Developed GPS Technology **(Amistad)**
- Thanks to a woman mathematician and the military, we now have GPS **(Amistad)**
- Beno Gutenberg, American seismologist **(Holocaust)**
- Beno Gutenberg, a German/American seismologist **(Holocaust)**

Pacing Guide

Can be found within LabAids.

Unit 5: The Rock Cycle

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Overview
Geoscience is a course focusing on the study of space, geologic structures and forces, the waters on our planet, and the atmospheric forces that shape our world. Students will explore the Earth's spheres including the geosphere, hydrosphere, cryosphere, atmosphere, and the cycles of the Earth such as the water and carbon cycle. Students will learn about scientific inquiry, geologic time, space exploration, the solar system, and the universe. Upon completion of the course, students will be sensitized to various moral and environmental issues being brought to the fore by research of the universe and other areas of earth and space science.

Essential Questions	Enduring Understandings
● What is the process of reservoir sedimentation? ● What are the effects of sedimentation and how does it affect humans? ● How do rivers transport and deposit sediments to balance the erosion and subsidence of their deltas? ● What is the evidence of ancient rivers in modern soils? ● Compare and contrast the continental crust and oceanic crust. ● What is the difference between a mineral and a rock? ● How are geologic columns used to compare relative ages of rock?	● Rivers and their tributaries continually erode and carry sediment from the land toward the ocean. ● The gradient of a river affects the speed of the water and the rate of erosion and transport. Water flows faster and erosion rates are higher when the gradient is steeper. ● The velocity of water flow affects the amount and size of particles (clay, silt, sand, and gravel) that the water can carry. When the water is flowing faster, it can carry a greater sediment load, including larger, denser particles. Due to an abrupt decrease in the velocity of water at a river's end, sediment settles and accumulates in deltas where rivers and streams meet a larger body of water, such as an ocean basin. ● The size and shape of a delta is affected by the amount of sediment load and interactions between the river and ocean water. As long as sediment is carried to and carried away by ocean water, the river will gradually build land out into the ocean basin. ● Many layers of sediment build up over time in a delta. As these layers settle, compress and dewater, the land surface on a delta subsides. The surface is built up again as new sediment layers are deposited on top. ● Over thousands and millions of years, sediment layers many kilometers in thickness can accumulate in a delta. As these layers are buried deeper and deeper, they are compressed and cemented together into sedimentary rocks. ● There are hazards associated with living in a delta region where land is actively forming and changing. Human interventions with a river sometimes have unintended consequences. Science can help to inform public policy decisions about human activities in a delta region. ● Earth's crust is composed of relatively few chemical elements. These elements are combined with each other to form a great variety of chemical compounds. ● There are two kinds of crust—continental and oceanic—which differ in chemical composition. The continental crust is less dense than oceanic crust because it has a higher proportion of silicon and oxygen, which are lighter elements. Because of this difference in density, oceanic crust sits lower in

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	elevation than continental crust, and oceanic plates dive beneath continental plates when they meet at a convergent plate boundary. ● Minerals, the building blocks of the rocks of Earth's crust, are naturally occurring solid materials that have a specific chemical composition and a characteristic internal crystal structure. ● The rocks of Earth's crust can be categorized into three basic rock types—sedimentary, igneous, or metamorphic —based on the way in which the rock formed. By studying these rocks and the evidence preserved within them, scientists are able to decipher Earth's history. ● The order of major events in Earth history and are able to articulate ideas about the relationships between them, applying what they have learned about Earth's systems and how they interact.

Unit 5: The Rock Cycle

Performance Expectations

- HS-ESS1-5: Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
- HS-ESS1-6: Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
- HS-ESS2-1: Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
- HS-ESS2-7: Construct an argument based on evidence about the coevolution of Earth's systems and life on Earth. (Changes in the atmosphere from plants and other organisms along with feedback mechanisms.)
- HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Core Ideas

- Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old.
- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history.
- Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust.
- Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials.
- Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history.
- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes.
- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.

Unit 5: The Rock Cycle

Performance Expectations

- The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it.
- Resource availability has guided the development of human society.
- Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations.
- Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.
- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.

Student Learning Objectives

Students will be able to:

- Investigate the ways in which river deltas build new land, reading about the plight of New Orleans in the aftermath of Hurricane Katrina.
- Model the role the river played in forming the land in Louisiana and investigate why the land beneath New Orleans is sinking now.
- Use sediment core data to construct cross sections of the subsurface along levees that failed during Hurricane Katrina, and think about what can and should be done to keep this city from drowning in the future.
- Read about James Hutton, known as the father of geology.
- Study samples of the rocks and minerals that make up the crust, and learn how to recognize clues that tell them true stories about Earth's history.

Integrated Accommodations and Modifications

Special Education Students	English Language Learners	At Risk
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests.	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support

• Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed	• Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Increase one on one time

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills. • Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments

Interdisciplinary Connections	Computer Science and Design Thinking
English/Language Arts Reading • RST.9-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. Writing • WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. • WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. • WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem;	**Computer Science and Design Thinking Practices** 1. □ Fostering an Inclusive Computing and Design Culture 2. ☑ Collaborating Around Computing and Design 3. □ Recognizing and Defining Computational Problems 4. □ Developing and Using Abstractions 5. □ Creating Computational Artifacts 6. □ Testing and Refining Computational Artifacts 7. ☑ Communicating About Computing and Design **Computer Science and Design Thinking Standards** • 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change. • 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

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narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WHST.9-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

Speaking and Listening
- SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

- 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.
- 8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
- 8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.
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Core Ideas
- Individuals select digital tools and design automated processes to collect, transform, generalize, simplify, and present large data sets in different ways to influence how other people interpret and understand the underlying information.
- Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information.
- The accuracy of predictions or inferences made from a computer model is affected by the amount, quality, and diversity of data.
- The design and use of computing technologies and artifacts can positively or negatively affect equitable access to information and opportunities.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices
- Act as a responsible and contributing community members and employee
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
- 9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1)
- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).
- 9.4.12.DC.8: Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection.

- 9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
- 9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2)
- 9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).
- 9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specific task (e.g., W.11-12.6.).
- 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

SEL Competencies

- **Self - Awareness**
- **Self - Management**
- **Social Awareness**
- **Responsible Decision Making**
- **Relationship Skills**

District/School Formative Assessment Plan	District/School Summative Assessment Plan

Formative assessment informs instruction and is ongoing throughout a unit to determine how students are progressing against the standards.
Teachers are encouraged to incorporate Formative Assessments into all lessons. During instruction, teachers will collect ongoing information on students' mastery of content through a variety of methods:
• Questioning: using Socratic method, probing questions, a hierarchical system in complexity (Bloom's Taxonomy)
• Exit tickets, rotational activities (stations), quizzes, and small group activities
• Classwork, homework, group work
• Pre-Assessments, teacher's observation, class discussion, and journal
• Journal Writing
• Daily Verbal Assessments
	Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.
	• **Activities:**
	  ○ **Modeling River Deposits**
	  ○ **Modeling a River Delta**
	  ○ **What Does a Real Delta Look Like?**
	  ○ **A View Beneath the Surface**
	  ○ **Settling Sediments**
	  ○ **Can Rocks Really Have Different Densities?**
	  ○ **Identifying Minerals by their Physical Characteristics**
	  ○ **Timeline of Major Events in Earth History**
	• **Task: Investigating Samples of the Crust**
	• **Other Summative Assessments:** Teachers are encouraged to design and their own assessments (topic/module tests and quizzes) individually and/or with their department or grade-level partners, as per Uniform Grading Profile.

Targeted Academic Vocabulary

erosion, deposition, delta, organic/inorganic sediments, chemical precipitates, clastic sedimentary rocks, subsurface, levees, igneous rocks, metamorphic rock, minerals, relative dating, strata, unconformity, intrusion, Law of Superposition, subsidence, meander

Resources:
• Weathering, Erosion & Deposition • The Rock Cycle • BrainPop: Relative Dating
Pacing Guide
Can be found within LabAids.

Unit 6: Earth's Resources & Final Challenge

Overview

Geoscience is a course focusing on the study of space, geologic structures and forces, the waters on our planet, and the atmospheric forces that shape our world. Students will explore the Earth's spheres including the geosphere, hydrosphere, cryosphere, atmosphere, and the cycles of the Earth such as the water and carbon cycle. Students will learn about scientific inquiry, geologic time, space exploration, the solar system, and the universe.

Upon completion of the course, students will be sensitized to various moral and environmental issues being brought to the fore by research of the universe and other areas of earth and space science.

Essential Questions	Enduring Understandings
• How do the rates of energy production and consumption in the United States compare to those of other countries? • What are the costs of benefits of various types of renewable and non-renewable energy sources? • What information is needed to make an informed decision about energy usage in a community? • How can we minimize waste production in communities? • Why are some minerals valuable and others not? • What would the world be like without minerals? • Does the financial gain outweigh the environmental impact of mining? • How does fossil fuel mining affect the Earth and its inhabitants? • What are some of the benefits and drawbacks of fossil fuels? • What solutions have some people come up with to decrease their use of fossil fuels? • What crises may arise from the unequal distribution of resources on Earth?	• The majority of the minerals that modern civilization relies on are relatively rare in Earth's crust. Such minerals are concentrated into economically viable ore deposits by natural geologic processes. Scientists use their understanding of these geologic processes to locate mineral resources. • That mineral ores are extracted from Earth in a variety of ways, including surface pit mining, dredging, and deep mining by tunneling below Earth's surface. The minerals are then purified and processed into useful materials by refining and smelting techniques. These methods are expensive, are energy intensive, and have associated environmental impacts. • People depend heavily on such fossil fuels as oil, natural gas, and coal. These fuels form from plant and animal matter through natural processes within Earth, and are preserved within Earth's crust only under only certain conditions. • Oil and associated natural gas, once formed in the source rock, will tend to rise to the surface because of density differences with water also contained in subsurface rock. The oil and gas may migrate long distances from the source rock. • Traditional oil reservoirs form in areas where oil does not migrate all the way to the surface but becomes trapped beneath low-permeability sedimentary rock layers and associated structures.

	• The conditions in which organic matter is transformed into oil and trapped in reservoirs are rare, and the process of oil formation typically takes millions of years. This means that oil is only found in certain parts of the world where the right conditions existed for its formation and preservation. • In order to find and produce oil today geologists use sophisticated technologies to see below the surface. Because most of the shallow and easily accessible oil in the United States has been tapped, oil companies are having to develop new technologies to draw oil from less permeable rock and to drill deeper and in less accessible places to find new oil reservoirs.

Unit 6: Earth's Resources & Final Challenge

Performance Expectations

- HS-ESS2-7: Construct an argument based on evidence about the coevolution of Earth's systems and life on Earth. (Changes in the atmosphere from plants and other organisms along with feedback mechanisms.)
- HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- HS-ESS3-2: Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost benefit ratios.
- HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
- HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Core Ideas

- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.
- The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it.
- Resource availability has guided the development of human society.
- Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations.
- All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors.
- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.
- The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources.
- Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.

Student Learning Objectives

Students will be able to:

- Explore the surprising extent to which they rely on Earth's crust for the materials in the objects around them.
- Put themselves in the shoes of mineral prospectors, they gain expertise in the different ways that mineral ores become concentrated within Earth's crust.
- Analyze river-sediment samples to search for molybdenum ore and refine copper from samples of malachite.
- Devise their own business plans for developing a mineral resource.
- Read about the Rub' al-Kahli—a desolate desert landscape in Saudi Arabia that overlays one of the largest oil reservoirs in the world.
- Investigate how oil reservoirs form naturally in Earth's crust, and how geologists go about finding this precious resource.
- Use their new knowledge to figure out why there is so much more oil in some regions than there is in others.
- Imagine a future when Earth's core has cooled completely.
- Use the knowledge they have gained about the geosphere to describe how this planet would be different.

Integrated Accommodations and Modifications

Special Education Students	English Language Learners	At Risk
• Utilize modifications & accommodations delineated in the student's IEP • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Provide repetition and practice. • Use visuals to demonstrate/model the processes • Restate, reread, and clarify directions/questions • Ask students to restate information, directions, and assignments. • Provide copy of class notes • Distribute study guide for classroom tests. • Provide preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Provide regular parent/ school communication • Allow extended time to complete assignment • Establish procedures for accommodations / modifications for assessments • Allow student to take/complete tests in an alternate setting as needed	WIDA Can Do Descriptors https://wida.wisc.edu/teach/can-do/descriptors • Modify Assignments • Use testing and portfolio assessment • Utilize Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary) • Repeat, rephrase, paraphrase key concepts and directions • Allow for extended time for assignment completion as needed • Highlight key vocabulary • Define essential vocabulary in context • Use graphic organizers, visuals, manipulatives and other concrete materials • Use gestures, facial expressions and body language • Read aloud • Build on what students already know and prior experience	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments. • Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Provide preferential seating to be mutually determined by the student and teacher • Allow the use of a computer to complete assignments. • Establish expectations for correct spelling on assignments • Provide extra textbooks for home. • Provide Peer Support • Increase one on one time

Gifted and Talented Students	504 Plan
• Utilize advanced, accelerated, or compacted content • Provide assignments that emphasize higher- level thinking skills.	• Pair visual prompts with verbal presentations • Ask students to restate information, directions, and assignments.

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• Allow for individual student interest • Gear assignments to development in areas of affect, creativity, cognition, and research skills • Allow for a variety in types of resources • Provide problem-based assignments with planned scope and sequence • Utilize inquiry-based instruction • Adjust the pace of lessons • Utilize Choice Boards • Provide Problem-Based Learning • Establish flexible Grouping	• Provide repetition and and practice • Model skills / techniques to be mastered. • Provide extended time to complete class work • Provide copy of class notes • Break long assignments into smaller parts • Assist student in setting short term goals • Allow for preferential seating to be mutually determined by the student and teacher • Provide extra textbooks for home. • Model and reinforce organizational systems (i.e. color-coding) • Write out homework assignments, check student's recording of assignments
Interdisciplinary Connections	**Computer Science and Design Thinking**
English/Language Arts Reading • RST.9-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. Writing • WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. • WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. • WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. • WHST.9-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. • WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. Speaking and Listening	**Computer Science and Design Thinking Practices** 1. □ Fostering an Inclusive Computing and Design Culture 2. ☑ Collaborating Around Computing and Design 3. □ Recognizing and Defining Computational Problems 4. □ Developing and Using Abstractions 5. □ Creating Computational Artifacts 6. □ Testing and Refining Computational Artifacts 7. ☑ Communicating About Computing and Design **Computer Science and Design Thinking Standards** • 8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change. • 8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. • 8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. • 8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices. • 8.1.12.IC.3: Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources. **Core Ideas** • Individuals select digital tools and design automated processes to collect, transform, generalize, simplify, and present large data sets in different ways to influence how other people interpret and understand the underlying information.

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• SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	• Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information. • The accuracy of predictions or inferences made from a computer model is affected by the amount, quality, and diversity of data. • The design and use of computing technologies and artifacts can positively or negatively affect equitable access to information and opportunities.

Career Readiness, Life Literacies and Key Skills

Career Readiness, Life Literacies and Key Skills Practices

- Act as a responsible and contributing community members and employee
- Consider the environmental, social and economic impacts of decisions.
- Demonstrate creativity and innovation.
- Utilize critical thinking to make sense of problems and persevere in solving them.
- Use technology to enhance productivity increase collaboration and communicate effectively.
- Work productively in teams while using cultural/global competence.

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Targeted Academic Vocabulary
Mineral ores, mineral prospecting, molybdenum ore, mineral extraction, malachite, fossil fuel, petroleum, oil reservoirs, resource distribution, surface pit mining, dredging, deep mining, smelt, energy intensive

Resources:
● How to Give Science Lessons a Real-World Boost ● Tips for Teaching Science to HS ● Mineral Deposits ● What are fossil fuels?
Pacing Guide
Can be found within LabAids.