



U1 - Astronomy

Draft Date	Course	Duration	Grades	Subjects	Team
06-07-2024	Grade 8 Science	8 Week(s)	8	Science	Lindsay Kabakjian, Allison Zmuda, Curtis Catwood, Savannah Byers, Wesley Maloney

Focus

What is the universe, and where does Earth fit in? In this unit, we will explore the origins of the solar system through the Big Bang Theory and investigate the properties of objects in space. We'll examine how gravity affects everything, from our planet to distant galaxies. Focusing on our local "neighborhood" — the Sun, Earth, and Moon system — we will create models to explain moon phases, eclipses, and seasons. Through hands-on activities, we'll discover how these celestial events impact life on Earth and our understanding of the universe.

Stage 1: Learning Goals

Established Goals	Transfer	
Standards	Long-Term Transfer Goals	
Pennsylvania Academic Standards Science (2023): 6-8 Standards ■ Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. Clarifying Statement: Examples of models can be physical, graphical, or conceptual. Assessment Boundary: N/A (3.3.6-8.A) ■ Develop and use a model to describe the role of gravity in the motion within galaxies and the solar system.	What kinds of long-term, independent accomplishments are desired? Students will be able to independently use their learning to... ■ Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions. (Communicator) (T1) ■ Participate in respectful discourse with peers, teachers, and experts in the field to share ideas, perspectives, and findings. (Collaborator, Communicator) (T2)	
	Meaning	
	Understandings	Essential Questions
	What specifically do you want students to understand? What inferences should they make? Students will understand that... ■ The universe is composed of a variety of different objects, which are organized into systems, each of which	What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering... ■ What is the universe, and what goes on in stars? (B & C) (Q1)

Clarifying Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).

Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth. (3.3.6-8.B)

- Analyze and interpret data to determine scale properties of objects in the solar system.

Clarifying Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.

Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies. (3.3.6-8.C)

develops according to accepted physical processes and laws. (U1)

- What are the predictable patterns caused by Earth's movement in the solar system? (A) (Q2)
- What is the universe, and what is Earth's place in it? (B & C) (Q3)

Acquisition of Knowledge & Skill

Knowledge

What facts and basic concepts should students know and be able to recall?
Students will know...

- Relationship between the Earth's axial tilt and the changing seasons. (A) (K1)
- Sun angle changes throughout the year. (A) (K2)
- The length of day and night varies depending on the time of year. (A) (K3)
- Eight main lunar phases. (A & C) (K4)
- Relative position of the Earth, Sun, and Moon to one another. (A) (K5)
- Solar and lunar eclipses do not occur every new and full moon. (A & C) (K6)
- The alignment of the Earth, Sun, and Moon causes eclipses. (A) (K7)
- The fundamental role of gravity is to govern the motion of celestial bodies within the solar system and galaxies. (B) (K8)
- Celestial bodies have gravity that acts on each other. (B) (K9)
- The Milky Way Galaxy is the home of the Solar System. (B) (K10)
- The objects in the Solar System orbit the Sun. (B) (K11)

Skills

What discrete skills and processes should students be able to use? Students can...

- I can make a model of the Earth, Sun, and Moon to show how they move. (A) (S1)
- I can use my model to explain why we have moon phases. (A) (S2)
- I can use my model to explain why solar and lunar eclipses happen. (A) (S3)
- I can describe how Earth's tilt and orbit cause the seasons. (A) (S4)
- I can create a model to show how gravity affects how planets and stars move. (B) (S5)
- I can explain how gravity keeps planets in orbit around the Sun. (B) (S6)
- I can describe how gravity works in galaxies and the solar system. (B) (S7)
- I can look at data and determine the size and distance of objects in space. (C) (S8)
- I can compare the sizes of planets, moons, and the Sun. (C) (S9)
- I can explain how far apart things are in our solar system using models or data. (C) (S10)

Profile of a CV Learner

- Collaboration: Students will be able to independently engage and meaningfully contribute to a team to reach a common goal, through mutual reflection, feedback, and shared responsibility. (PCVL.CO)
- Communication: Students will be able to independently and confidently adapt their writing and speaking in relation to audience, task, and purpose, as well as practice active listening to understand other perspectives, viewpoints, and cultures. (PCVL.CM)

- The Big Bang Theory is the likely origin of the Universe and our Solar System. (B) (K12)
- A protoplanetary disk is composed of materials like gas and dust that led to the formation of the Sun and other objects in the Solar System. (B) (K13)
- Orbits are elliptical. (C) (K14)
- Scientists use different wavelengths of light to study the universe (C) (K15)

- I can explain how different wavelengths of light are used to study the universe. (C) (S11)



U2 - Earth's History & Processes

Draft Date 07-15-2024	Course Grade 8 Science	Duration 6 Week(s)	Grades 8	Subjects Science	Team Allison Zmuda, Lindsay Kabakjian, Curtis Catwood, Savannah Byers, Wesley Maloney
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Focus

How and why is Earth constantly changing? In this unit, we will uncover the dynamic processes that shape our planet, exploring how Earth's surface has evolved over time. We will model the movement of materials and energy through Earth's systems, showing how these interconnected spheres work together to support life. As we dive deeper into Earth's history, we will investigate fossils, rocks, and seafloor structures to learn about plate tectonics and Earth's 4.6 billion-year evolution. Through hands-on activities and inquiry, we will unravel the mysteries of Earth's geologic history and understand how past events have shaped the world we live in today.

Stage 1: Learning Goals

Established Goals	Transfer			
Standards	Long-Term Transfer Goals			
Pennsylvania Academic Standards Science (2023): 6-8 Standards Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. Clarifying Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.	What kinds of long-term, independent accomplishments are desired? Students will be able to independently use their learning to... - Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions. (Communicator) (T1) - Participate in respectful discourse with peers, teachers, and experts in the field to share ideas, perspectives, and findings. (Collaborator, Communicator) (T2)			
	Meaning			
	<table> <tr> <th>Understandings</th><th>Essential Questions</th></tr> <tr> <td> What specifically do you want students to understand? What inferences should they make? Students will understand that... - Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) </td><td> What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering... - How do people reconstruct and date events in Earth's planetary history? (Q1) </td></tr> </table>	Understandings	Essential Questions	What specifically do you want students to understand? What inferences should they make? Students will understand that... Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere)
Understandings	Essential Questions			
What specifically do you want students to understand? What inferences should they make? Students will understand that... Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere)	What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering... How do people reconstruct and date events in Earth's planetary history? (Q1)			

Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record. (3.1.6-8.0)

- Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year old history.

Clarifying Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.

Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them. (3.3.6-8.D)

- Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

Clarifying Statement: Emphasis is on how processes change Earth's surface at time

that interact over a wide range of temporal and spatial scales. (U1)

- How and why is Earth constantly changing? (Q2)

Acquisition of Knowledge & Skill

Knowledge

What facts and basic concepts should students know and be able to recall?
Students will know...

- Earth is approximately 4.6 billion years old, and scientists determine this through the study of rocks and fossils. (D) (K1)
- The geologic time scale is used to organize Earth's history into eons, eras, periods, and epochs based on significant geologic and biological events. (D) (K2)
- Fossils and rock strata provide evidence for major events in Earth's history, such as mass extinctions and evolutionary changes. (D) (K3)
- Scientists use relative dating (superposition, cross-cutting relationships, and index fossils) and absolute dating (radiometric dating) to determine the age of rocks and events in Earth's history. (D) (K4)
- The rock cycle describes how Earth's materials continuously change through processes like melting, crystallization, weathering, deformation, and sedimentation. (F) (K5)
- Igneous rocks form from cooled magma or lava, sedimentary rocks form from compacted and cemented sediments,

Skills

What discrete skills and processes should students be able to use? Students can...

- I can describe how Earth's history is divided into different time periods using the geologic time scale. (D) (S1)
- I can use rock layers and fossils to explain the order of events in Earth's history. (D) (S2)
- I can explain how scientists use rock strata to figure out which events happened first. (D) (S3)
- I can give examples of major events in Earth's past and where they fit on the geologic time scale. (D) (S4)
- I can create a model to show how rocks move through the rock cycle. (F) (S5)
- I can describe how Earth's internal heat and the sun's energy power Earth's material cycles. (F) (S6)
- I can explain how materials like rocks, water, and gases move between Earth's systems (geosphere, atmosphere, hydrosphere, and biosphere). (F) (S7)
- I can show how energy flow connects to melting, erosion, and weathering processes. (F) (S8)

and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.

Assessment Boundary: N/A (3.3.6-8.E)

- Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

Clarifying Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.

Assessment Boundary: Assessment does not include the identification and naming of minerals. (3.3.6-8.F)

- Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions.

and metamorphic rocks form from heat and pressure. (F) (K6)

- The cycling of Earth's materials is driven by energy from the Earth's interior (heat from radioactive decay and mantle convection) and the Sun (weathering, erosion, and sedimentation). (F) (K7)
- Weathering, erosion, and deposition constantly reshape Earth's surface over different time scales. (E) (K8)
- Weathering (mechanical and chemical) breaks down rocks, and erosion moves sediments by wind, water, ice, and gravity. (E) (K9)
- Deposition occurs when sediments are dropped in new locations, eventually leading to the formation of sedimentary rocks. (F) (K10)
- Geologic catastrophes, such as asteroid impacts, supervolcanic eruptions, and massive earthquakes, have caused major shifts in Earth's history, sometimes leading to extinctions. (E) (K11)
- Scientists study local rock formations, fossils, and geologic structures to understand how specific geoscience processes have shaped different regions. (E) (K12)
- Models are used to represent and explain the cycling of materials and the energy flow within Earth's system, helping scientists visualize complex processes. (F) (K13)

- I can describe how fast changes like earthquakes and volcanoes shape Earth's surface. (E) (S9)
- I can explain how slow processes like erosion and plate movement change the land over long periods. (E) (S10)
- I can compare the effects of geoscience processes that happen quickly with those that happen slowly. (E) (S11)
- I can construct evidence-based explanations for how specific geoscience processes have shaped local geographic features. (E) (S12)
- I can use evidence to show how natural processes have shaped different landforms over time. (E) (S13)
- I can use fossil and rock data to show how continents have moved over time. (G) (S14)
- I can explain how the shapes of continents and ocean floor features support the idea of plate movement. (G) (S15)
- I can use maps and data to describe where Earth's plates move and what happens at those boundaries. (G) (S16)
- I can identify patterns in seafloor spreading and how they support the theory of plate tectonics. (G) (S17)
- I can analyze fossil data to see how life on Earth has changed over time. (O) (S18)

Clarifying Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).

Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed. (3.3.6-8.G)

Profile of a CV Learner

- Collaboration: Students will be able to independently engage and meaningfully contribute to a team to reach a common goal, through mutual reflection, feedback, and shared responsibility. (PCVL.CO)
- Communication: Students will be able to independently and confidently adapt their writing and speaking in relation to audience, task, and purpose, as well as practice active listening to understand other perspectives, viewpoints, and cultures. (PCVL.CM)

- The inner core is solid due to extreme pressure, while the outer core is liquid, generating Earth's magnetic field. (D, F) (K14)
- Seismic waves provide evidence for Earth's layered structure, with S-waves only traveling through solids and P-waves traveling through both solids and liquids. (D, F) (K15)
- The shapes of continents (like how South America and Africa seem to fit together) provide evidence of continental drift. (K16)
- Fossils of the same species found on different continents suggest the continents were once connected. (K17)
- Similar rock layers and mountain ranges found on different continents support the idea of past plate movement. (K18)
- Seafloor spreading at mid-ocean ridges is evidence of plates moving apart. (K19)
- The age of oceanic crust increases as you move away from mid-ocean ridges. (G) (K20)
- Features like trenches, mountains, and earthquakes often occur near plate boundaries. (G) (K21)
- Fossils are the preserved remains or traces of organisms from the past. (O) (K22)
- The fossil record shows patterns of life appearing, evolving, and going extinct over time. (O) (K23)

- I can explain extinction patterns and the appearance of new life forms in the fossil record. (O) (S19)
- I can describe how scientists use fossils to learn about past environments and ecosystems. (O) (S20)
- I can explain how natural laws (like sedimentation) help us understand what fossils tell us about Earth's history. (O) (S21)

- Extinction is a natural part of Earth's history and can be seen in the fossil record. (O) (K24)
- Certain fossils, called index fossils, help scientists date the rock layers in which they are found. (O) (K25)
- Similar fossils found in different locations can provide clues about past environments and continental positions. (O) (K26)
- Fossil evidence supports the idea that life has changed gradually over millions of years. (O) (K27)



U3 - Natural Hazards

Draft Date 06-07-2024	Course Grade 8 Science	Duration 4 Week(s)	Grades 8	Subjects Science	Team Lindsay Kabakjian, Allison Zmuda, Curtis Catwood, Savannah Byers, Wesley Maloney
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Focus

How do we prepare for natural hazards? In this unit, we will explore the causes and impacts of natural hazards, starting with the 2011 Tōhoku earthquake and tsunami. We'll use maps, simulations, and data to understand how tsunamis form, where they occur, and which areas are at risk. Students will design and evaluate engineering solutions to reduce damage, and explore communication strategies to prepare and protect communities. By the end, we will apply these ideas to respond to various natural hazards and learn how to design safer communities to save lives.

Stage 1: Learning Goals

Established Goals	Transfer	
Standards	Long-Term Transfer Goals	
Pennsylvania Academic Standards Science (2023): 6-8 Standards Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. Clarifying Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable.	What kinds of long-term, independent accomplishments are desired? Students will be able to independently use their learning to... - Approach science as a reliable and testable way of knowing and explaining the natural world and designed world. (Life-Long Learner) (T1) - Participate in respectful discourse with peers, teachers, and experts in the field to share ideas, perspectives, and findings. (Collaborator, Communicator) (T2)	
	Meaning	
	Understandings	Essential Questions
	What specifically do you want students to understand? What inferences should they make? Students will understand that... Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere)	What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering... How do natural hazards affect individuals and societies? (L) (Q1)

Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).

Assessment Boundary: N/A (3.3.6-8.L)

Technology & Engineering (2023): 6-8 Technology & Engineering

- Interpret the accuracy of information collected. (3.5.6-8.O)
- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (3.5.6-8.P)
- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (3.5.6-8.W)

Profile of a CV Learner

- Collaboration: Students will be able to independently engage and meaningfully

that interact over a wide range of temporal and spatial scales. (U1)

Acquisition of Knowledge & Skill

Knowledge

What facts and basic concepts should students know and be able to recall?
Students will know...

- Natural hazards include events like earthquakes, floods, hurricanes, droughts, and tornadoes. (L) (K1)
- Scientists use data from past events to predict the likelihood of future natural disasters. (L) (K2)
- The difference between a natural hazard and a catastrophic event. (L) (K3)
- Certain areas are more prone to specific natural hazards due to geography and climate. (L) (K4)
- Forecasting catastrophic events relies on data such as weather patterns, seismic activity, and historical trends. (L) (K5)
- Technologies like satellites, weather radar, and seismographs help monitor and predict natural hazards. (L) (K6)
- Technology development can reduce the damage caused by natural hazards (e.g., earthquake-resistant buildings, levees). (L) (K7)
- Communication of hazard risks and safety plans is a key part of disaster preparedness. (L) (K8)

Skills

What discrete skills and processes should students be able to use? Students can...

- I can study data about natural disasters like tsunamis, floods, hurricanes, and earthquakes. (L) (S1)
- I can use data to predict when and where natural hazards might happen. (L) (S2)
- I can explain how technology can help protect people and property from natural hazards. (L) (S3)
- I can describe how we can prepare for and reduce the impact of natural disasters. (L) (S4)

contribute to a team to reach a common goal, through mutual reflection, feedback, and shared responsibility. (PCVL.CO)

- Communication: Students will be able to independently and confidently adapt their writing and speaking in relation to audience, task, and purpose, as well as practice active listening to understand other perspectives, viewpoints, and cultures. (PCVL.CM)
- Life-Long Learner: Students will be able to independently use their learning to analyze past and ongoing performance, adjust thinking processes to new contexts, and use information to make informed and conscientious decisions. (PCVL.LLL)



U4 - Weather & Climate

Draft Date 06-07-2024	Course Grade 8 Science	Duration 9 Week(s)	Grades 8	Subjects Science	Team Lindsay Kabakjian, Allison Zmuda, Curtis Catwood, Savannah Byers, Wesley Maloney
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Focus

How are local weather patterns linked to global climate? In this unit, we will explore how energy from the Sun and the force of gravity drive the movement of water through Earth's systems. We will investigate how these movements shape weather in our local communities and connect to global climate patterns. Through hands-on models, data analysis, and discussions, we will see how water and energy cycle through the air, land, and oceans. We'll also explore how humans impact these systems and how we can work toward protecting Earth's climate for the future.

Stage 1: Learning Goals

Established Goals	Transfer	
Standards	Long-Term Transfer Goals	
Pennsylvania Academic Standards Science (2023): 6-8 Standards Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. Clarifying Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical. Assessment Boundary: A quantitative understanding of the latent heats of	What kinds of long-term, independent accomplishments are desired? Students will be able to independently use their learning to... - Make and use observations to analyze relationships and patterns in order to explain phenomena, develop models, and make predictions. (Communicator) (T1) - Participate in respectful discourse with peers, teachers, and experts in the field to share ideas, perspectives, and findings. (Collaborator, Communicator) (T2)	
	Meaning	
	Understandings	Essential Questions
	What specifically do you want students to understand? What inferences should they make? Students will understand that... Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere)	What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering... What regulates weather and climate? (Q1)

vaporization and fusion is not assessed. (3.3.6-8.H)

- Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Clarifying Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.

Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect. (3.3.6-8.I)

- Collect data to provide evidence for how the motion and complex interactions of air masses result in changes in weather conditions.

Clarifying Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how

that interact over a wide range of temporal and spatial scales. (U1)

- How do the properties and movements of water shape Earth's surface and affect its systems? (Q2)

Acquisition of Knowledge & Skill

Knowledge

What facts and basic concepts should students know and be able to recall?
Students will know...

- Water moves through Earth's systems in a continuous cycle, including processes like evaporation, condensation, precipitation, and runoff. (H) (K1)
- The sun's energy drives the water cycle by providing heat that causes evaporation from bodies of water. (H) (K2)
- Gravity plays a key role in the movement of water, such as pulling precipitation back to Earth and creating runoff into rivers and oceans. (H) (K3)
- Water in the atmosphere can form clouds, which then release water as precipitation. (H) (K4)
- Regional climates are influenced by atmospheric circulation patterns caused by uneven heating of the Earth's surface. (I) (K5)
- Earth's rotation affects the movement of air and ocean currents, leading to different climate patterns around the world. (I) (K6)
- Atmospheric circulation is driven by the difference in temperature and pressure at different latitudes on Earth. (I) (K7)

Skills

What discrete skills and processes should students be able to use? Students can...

- I can make a model to show how water moves through Earth's systems. (H) (S1)
- I can explain how the Sun's energy and gravity help move water in the water cycle. (H) (S2)
- I can describe the steps of the water cycle like evaporation, condensation, precipitation, and runoff. (H) (S3)
- I can use a model to show how the Sun heats Earth unevenly. (I) (S4)
- I can explain how Earth's rotation and heating cause wind and ocean currents. (I) (S5)
- I can describe how these patterns affect weather and climate in different regions. (I) (S6)
- I can collect and use weather data to learn about air masses. (J) (S7)
- I can explain how the movement of air masses causes weather changes. (J) (S8)
- I can describe how cold fronts, warm fronts, and pressure systems affect the weather. (J) (S9)
- I can collect and study data about the environment around me. (Env-E) (S10)

sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).

Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations. (3.3.6-8.J)

Environmental Literacy & Sustainability (2023): 6-8 Environmental Literacy & Sustainability

- Collect, analyze, and interpret environmental data to describe a local environment. (3.4.6-8.E)

Profile of a CV Learner

- Collaboration: Students will be able to independently engage and meaningfully contribute to a team to reach a common goal, through mutual reflection, feedback, and shared responsibility. (PCVL.CO)
- Communication: Students will be able to independently and confidently adapt their writing and speaking in relation to audience, task, and purpose, as well as practice active listening to understand other perspectives, viewpoints, and cultures. (PCVL.CM)

- Warm air rises near the equator and cool air sinks at the poles, creating convection currents in the atmosphere. (I) (K8)
- Air masses form over specific regions and can influence local weather patterns, such as dry, warm air from deserts or moist, cool air from oceans. (J) (K9)
- Air masses interact at fronts, leading to weather changes like storms, rain, or temperature shifts. (J) (K10)
- Changes in air pressure, temperature, and humidity contribute to the development of different weather conditions. (J) (K11)
- Local environments can be studied by collecting and analyzing data, such as temperature, humidity, and air quality. (Env-E) (K12)
- The characteristics of a local environment, like the presence of forests, rivers, or urban areas, influence the ecosystem and local climate. (Env-E) (K13)
- Human activities can affect local environments, such as through pollution, deforestation, or land development. (Env-E) (K14)
- Analyzing environmental data can help identify trends and predict future environmental changes. (Env-E) (K15)
- Environmental data can be used to inform decisions on resource management and sustainability. (Env-E) (K16)

- I can describe what I notice about my local environment using facts and data. (Env-E) (S11)
- I can explain how environmental changes affect plants, animals, and people nearby. (Env-E) (S12)



U5 - Earth's Resources

Draft Date 06-07-2024	Course Grade 8 Science	Duration 7 Week(s)	Grades 8	Subjects Science	Team Lindsay Kabakjian, Allison Zmuda, Curtis Catwood, Savannah Byers, Wesley Maloney
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Focus

How do changes in Earth's systems impact our communities, and what can we do about it? In this unit, we will explore how rising temperatures are linked to events like floods, droughts, and wildfires. We will analyze data, build models, and investigate how changes in Earth's water and carbon systems affect people and places. As we uncover how human activity contributes to climate change, we will evaluate real-world solutions that balance community needs with reducing greenhouse gases and building more resilient communities.

Stage 1: Learning Goals

Established Goals	Transfer	
Standards	Long-Term Transfer Goals	
Pennsylvania Academic Standards Science (2023): 6-8 Standards Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. Clarifying Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited	What kinds of long-term, independent accomplishments are desired? Students will be able to independently use their learning to... - Explain how the natural and designed worlds are interrelated and the application of scientific knowledge and technology can have beneficial, detrimental, or unintended consequences. (Global Citizen, Communicator) (T1) - Participate in respectful discourse with peers, teachers, and experts in the field to share ideas, perspectives, and findings. (Collaborator, Communicator) (T2)	
	Meaning	
	Understandings	Essential Questions
	What specifically do you want students to understand? What inferences should they make? Students will understand that... The Earth's surface processes affect and are affected by human activities. (U1)	What thought-provoking questions will foster inquiry, meaning making, and transfer? Students will keep considering... How do Earth's processes and human activities impact each other and alter the planet? (Q1)

to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).

Assessment Boundary: N/A (3.3.6-8.K)

- Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.

Clarifying Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).

Assessment Boundary: N/A (3.3.6-8.M)

- Construct an argument supported by evidence for how increases in human population and per capita consumption of natural resources impact Earth's systems.

Clarifying Statement: Examples of evidence include grade-appropriate databases on human populations and the

- How do humans rely on and manage Earth's resources across cultures? (Q2)
- How do human cultures interact with, value, and express beliefs about the environment? (Q3)
- How can local field investigations help address environmental issues and support solutions on a larger scale? (Q4)
- How do actions and regulations ensure equitable resource availability for current and future generations? (Q5)

Acquisition of Knowledge & Skill

Knowledge

What facts and basic concepts should students know and be able to recall?
Students will know...

- Earth's natural resources like minerals, fossil fuels, and groundwater are not evenly distributed across the planet. (K) (K1)
- Past geologic events like volcanic activity, tectonic plate movement, and glaciation affect where resources are found. (K) (K2)
- Current geoscience processes, like erosion and sedimentation, also influence where resources collect. (K) (K3)
- The availability of resources affects where people live and how economies develop. (K) (K4)

Skills

What discrete skills and processes should students be able to use? Students can...

- I can describe how Earth's processes (like volcanoes or earthquakes) helped create where resources are found today. (K) (S1)
- I can use evidence to show how past events, like glacier movement, affect where we find resources now. (K) (S2)
- I can design a way to reduce human impact on the environment using science ideas. (M) (S3)
- I can devise a plan to monitor my community's pollution, waste, or resource use. (M) (S4)
- I can use what I know about science to help protect the Earth. (M) (S5)
- I can explain how more people and resource use affect Earth's systems. (N) (S6)

rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.

Assessment Boundary: N/A (3.3.6-8.N)

- Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Clarifying Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.

Assessment Boundary: N/A (3.3.6-8.O)

- Locating and using natural resources depends on understanding Earth's history and processes. (K) (K5)
- Human activities like deforestation, pollution, and fossil fuel use affect the environment. (M) (K6)
- Scientific methods can be used to monitor things like air and water quality. (M) (K7)
- Humans can reduce their impact by using renewable resources and conserving energy and water. (M) (K8)
- Solutions like recycling, green energy, and reducing emissions help protect ecosystems. (M) (K9)
- Designing sustainable practices involves using science to balance human needs with environmental health. (M) (K10)
- As the human population grows, so does the demand for natural resources like water, energy, and food. (N) (K11)
- Increased resource use can lead to pollution, habitat destruction, and climate change. (N) (K12)
- "Per capita consumption" means how much each person uses on average. (N) (K13)
- Overconsumption can cause long-term damage to Earth's systems. (N) (K14)
- Using evidence is important to explain how human actions affect the planet. (N) (K15)
- Earth's average temperature has risen over the past century. (O) (K16)

- I can use evidence to show how human actions like building, farming, and using energy impact the environment. (N) (S7)
- I can create an argument with facts about how we are changing the planet. (N) (S8)
- I can ask good questions about what's causing global warming. (O) (S9)
- I can use evidence to learn why Earth's temperature is rising. (O) (S10)
- I can explain how human activities and natural processes affect climate change. (O) (S11)
- I can compare how different societies use natural resources. (Env-B) (S12)
- I can explain how culture and economics affect how people manage the environment. (Env-B) (S13)
- I can look at how resource use is different around the world. (Env-B) (S14)
- I can gather and understand information about environmental problems in Pennsylvania. (Env-D) (S15)
- I can explain how these problems affect both people and nature in my state. (Env-D) (S16)
- I can use different sources to learn about PA's environment and what we can do to help. (Env-D) (S17)
- I can find and share information about how people use and protect natural resources. (Env-G) (S18)

Environmental Literacy & Sustainability (2023): 6-8 Environmental Literacy & Sustainability

- Analyze and interpret data about how different societies (economic and social systems) and cultures use and manage natural resources differently. (3.4.6-8.B)
- Gather, read, and synthesize information from multiple sources to investigate how Pennsylvania environmental issues affect Pennsylvania's human and natural systems. (3.4.6-8.D)
- Obtain and communicate information to describe how best resource management practices and environmental laws are designed to achieve environmental sustainability. (3.4.6-8.G)

Profile of a CV Learner

- Collaboration: Students will be able to independently engage and meaningfully contribute to a team to reach a common goal, through mutual reflection, feedback, and shared responsibility. (PCVL.CO)
- Communication: Students will be able to independently and confidently adapt their writing and speaking in relation to audience, task, and purpose, as well as practice active listening to understand other perspectives, viewpoints, and cultures. (PCVL.CM)
- Global Citizenship: Students will be able to mindfully and respectfully seek to understand the ideas and perspectives of others to responsibly participate in all facets of local and global society. (PCVL.GC)

- Greenhouse gases like carbon dioxide trap heat in the atmosphere. (O) (K17)
- Human activities, especially burning fossil fuels, contribute to the rise in global temperatures. (O) (K18)
- Scientists use data from ice cores, temperature records, and satellite images to study climate change. (O) (K19)
- Asking scientific questions helps us understand complex issues like global warming. (O) (K20)
- Different societies and cultures use and manage natural resources in different ways. (B) (K21)
- Social, economic, and environmental values influence how resources are used. (B) (K22)
- Some cultures rely heavily on natural resources while others focus on conservation and sustainability. (B) (K23)
- Comparing resource use can help us understand global environmental challenges. (B) (K24)
- Pennsylvania faces environmental challenges such as water pollution, habitat loss, and fracking, which affect both people and ecosystems. (D) (K25)
- Gathering and evaluating information from different sources helps us understand these issues. (D) (K26)
- Informed citizens can take action to solve local environmental problems. (D) (K27)

- I can explain how laws and rules help take care of the environment. (Env-G) (S19)
- I can describe ways to use resources wisely so they don't run out. (Env-G) (S20)
- I can talk about how we can keep the Earth healthy for the future. (Env-G) (S21)

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| | <ul style="list-style-type: none">■ Best management practices (BMPs) help reduce human impact on the environment. (G) (K28)■ Environmental laws are made to protect air, water, land, and wildlife. (G) (K29)■ Sustainability means meeting our needs without harming future generations. (G) (K30)■ Laws and practices like recycling, conservation, and pollution limits support sustainability. (G) (K31)■ People can work together to make responsible choices that help the environment. (G) (K32) | |
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