EDC EARTH SCIENCE SEMESTER 1

The first semester introduces students to Earth's systems and focuses on the hydrosphere and atmosphere. Students explore the sources of freshwater on the continents and the effects of currents in the world's oceans. They delve into the science of climate and climate change, exploring the factors that affect climate locally and globally and investigating the causes of climate change in Earth's past.

CHAPTER	SCIENCE CONCEPTS	LEARNING ACTIVITIES
INTRODUCING EARTH SCIENCE		
Chapter 1 Comparing Earth to Other Worlds	Introduction to Earth's systems; basic requirements for sustaining life	Students read an excerpt from a science fiction story about Mars colonists and analyze the resources necessary to sustain human populations on this neighboring planet.
UNIT 1: HYDROSPHERE: WATER IN EARTH'S SYSTEMS		
Chapter 2 Life's Blood: Seeking Water from Earth	Water cycle; surface water, groundwater, assessing and protecting water supplies	Students learn about droughts in Texas and Tennessee, and consider how access to plentiful and clean water is critical to human survival. They build their knowledge about how water is obtained by reviewing the water cycle and learning the science behind surface and groundwater supplies. After researching 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.
Chapter 3 Rivers of the Sea: Ocean Currents	Global patterns of ocean circulation; how wind and density differences drive ocean currents; global conveyor belt; El Niño	Students 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. Students gather knowledge about the science of ocean currents to decide whether his idea was crazy or had a chance of success.
UNIT 2: ATMOSPHERE AND CLIMATE		
Chapter 4 Local Connections: Regional Climate	Climate and weather; influence of latitude, atmospheric circulation, proximity to ocean, elevation, land features, and prevailing winds on regional climate	Students start their exploration of climate close to home, learning about the climate in their local area and comparing it to a chosen travel destination. Students learn how climate is measured and how it affects the flora and fauna of a landscape. They investigate key factors that cause climate to vary so much around the world.
Chapter 5 The Bigger Picture: Global Climate	Energy balance, albedo effect, greenhouse effect, carbon cycle, positive and negative feedback loops	Students 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. Based on what they've learned, they consider whether members of the Alaskan community should move or stay, and prepare recommendations to share at a public meeting.
Chapter 6 The Longest Experiment: Climate Change in Earth's History	Paleoclimatology, climate proxies, climate change in Earth's past, Milankovitch cycles, tectonic processes that influence climate, human impact on climate	Students 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. Students 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. They look at evidence that Earth's climate is changing now and how human activity and natural factors contribute to this change.
MID-YEAR CHALLENGE		
Chapter 7 Broadcast from the Future	Synthesis of concepts learned in the first part of the course	Students 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. They communicate their predictions in a news broadcast from the future.

EDC EARTH SCIENCE SEMESTER 2

During the second semester of *EDC Earth Science,* students gain a deeper understanding of Earth's systems by exploring Earth's place in the universe and the workings of the geosphere. They study how solar systems form as part of the life cycle of stars and investigate how Earth's interior and surface are moving and changing. They examine evidence of tectonic plate movement as they investigate volcanic eruptions and earthquakes that have occurred in the western United States. They explore rock cycle processes and use clues in rocks to determine events that have happened in Earth's past. After gaining a greater appreciation of Earth's geosphere, students revisit the solid Earth from a human perspective. They explore how the geosphere provides critical natural resources, and how human's use of these resources has affected the balance of Earth's systems.

CHAPTER	SCIENCE CONCEPTS	LEARNING ACTIVITIES
UNIT 3: EARTH'S PLACE IN THE UNIVERSE		
Chapter 8 Stars, Planets, and Everything in Between: Solar System Origins	Solar system formation, Kepler's Laws, radioactive dating, life cycle of stars, spectroscopy	Students explore Earth's place in the universe by investigating how planets and solar systems form as part of the life cycles of stars. They gather evidence for the solar nebular theory from the observable patterns of motion in the solar system. They learn about methods for dating the age of Earth and other solar system objects. They 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. They learn about Kepler's Laws of Motion and investigate the geometry of movement of orbits. They 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.
Chapter 9 Journey to the Center of the Earth: Exploring Earth's Interior	Earth's interior structure and composition, internal sources of heat energy, seismic waves, introduction to plate tectonic theory, driving forces of plate movement	Students 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.
UNIT 4: PLATE TECTONICS		
Chapter 10 On Shaky Ground: Earthquakes and Transform Boundaries	Transform-fault boundaries, earthquakes, physical and computer models, earthquake forecasting	Students 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. They 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.
Chapter 11 Sleeping Dragons? Subduction-Zone Volcanoes	Subduction zones, volcanoes and types of volcanic eruptions, technologies for volcano monitoring, data analyses	Students examine the relationship of the Cascade volcanoes in Washington, Oregon, and California to the subduction zone along the Northwest coast. They plot earthquake data to delineate a subduction zone and learn how scientists monitor changes beneath a volcano that may signal an imminent eruption. Ultimately, students 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.
Chapter 12 Clues on the Ocean Floor: Divergent Boundaries	Seafloor spreading, paleomagnetism, plate tectonics summary, landforms associated with plate boundaries	Students 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. They pull together what they've learned about plate tectonic processes that occur along divergent, convergent, and transform-plate boundaries.

UNIT 5: THE ROCK CYCLE		
Chapter 13 Mississippi Blues: Sedimentary Processes in a Delta	Erosion and deposition, deltaic processes, formation of sedimentary rock	Students investigate the ways in which river deltas build new land, reading about the plight of New Orleans in the aftermath of Hurricane Katrina. Students model the role the river played in forming the land in Louisiana and investigate why the land beneath New Orleans is sinking now. They 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.
Chapter 14 A Solid Foundation: Building Earth's Crust	The nature of rocks and minerals, rock cycle, relative dating, Earth's history	Students read about James Hutton, known as the father of geology. They 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.
UNIT 6: EARTH RESOURCES		
Chapter 15 Hidden Treasures in Rocks: Mineral Resources	The geologic processes by which mineral ores are formed, mineral prospecting, mineral extraction and processing	Students explore the surprising extent to which they rely on Earth's crust for the materials in the objects around them. Putting themselves in the shoes of mineral prospectors, they gain expertise in the different ways that mineral ores become concentrated within Earth's crust. They analyze river-sediment samples to search for molybdenum ore and refine copper from samples of malachite. Ultimately, they devise their own business plans for developing a mineral resource.
Chapter 16 The Mystery of the Rub' al-Kahli: Energy Resources in Earth's Crust	Fossil fuel formation, petroleum resources and exploration technologies	Students read about the Rub' al-Kahli—a desolate desert landscape in Saudi Arabia that overlays one of the largest oil reservoirs in the world. Students investigate how oil reservoirs form naturally in Earth's crust, and how geologists go about finding this precious resource. They then use their new knowledge to figure out why there is so much more oil in some regions than there is in others.
FINAL CHALLENGE		
Chapter 17 A Different Earth	Synthesis of concepts learned in Earth Science 2	Students imagine a future when Earth's core has cooled completely. They use the knowledge they have gained about the geosphere to describe how this planet would be different.

Scope and Sequence - Chapter 1

The following sequence assumes that most readings are done in class, and 2–4 days can be saved if readings and associated questions are done for homework, and briefly reviewed in class upon completion.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter and discuss *Brainstorming* question. *What's the Story?*—"Two Travelers in a Distant World"	Students begin to think about what it would be like to try to live on another world. Students read an excerpt from the science fiction book *Red Mars* by Kim Stanley Robinson, in which two colonists explore the surface of Mars in a dirigible. They think about the differences between it and Earth. This will lead them to the challenge: determining what humans would need to colonize Mars and planning how to do so.
	Investigate	Gather Knowledge	2	*What's the Story?*—"Two Travelers in a Distant World" Introduce *Challenge* *Activity*—"Survival on Earth and Mars"	Students discuss and develop a list of the basic requirements for human habitation of a planet, research what's currently known about the planet Mars, and develop a list of the top five survival challenges a Mars colony would face.
			3	*Activity*—Part A: "Brainstorming Survival Needs"	
			4	*Activity*—Part B: "Differences Between Earth and Mars"	
		Address the Challenge	5	*Address the Challenge*	Students work in planning groups to identify goals, challenges, and further questions associated with obtaining food, water, shelter, and energy on Mars. They prepare to present their ideas to the class.
2	**Process**		6	*Share* presentations	Students present their ideas about how food, shelter, water, and energy might be obtained on Mars.
			7	*Discuss*	In the closing class discussion, students think critically about the ideas that were presented, about the possible need for colonizing another planet, and about the challenges of trying to re-create Earth-like conditions on another world, such as Mars.

Scope and Sequence - Chapter 2

The following is provided to help with your lesson planning. Adjust it according to the needs and interests of your classroom, and whether you assign readings as homework or complete them in class.

WEEK			DAY		PREVIEW
1	Consider		1	Introduce chapter, and discuss *Brainstorming* questions.	Students brainstorm about Earth processes that involve water, reinforcing the importance of water to the functioning of all of Earth's systems. They think about the importance of water in their daily lives and the possibility that water could become scarce in their community. They diagram their ideas of where their household water comes from.
			2	*What's the Story?*—"Water Runs Dry." Discuss *About the Reading* questions.	*What's the Story:* Students read a story about a community in Tennessee that ran out of water. They think about the factors that could strain water supplies and about what they would do if they had difficulty obtaining water.
			3	*Task 1*—"How Much Water Do You Use?"	*Task 1—Students estimate their personal daily water use. They think about why people in the United States typically use more water than people in other parts of the world.*
			4	*Task 2*—"Thinking Beyond the Bathwater." Introduce *Address the Challenge.*	*Task 2*—Students think about the ways they indirectly consume water that is used to grow their food and produce products that they use. They study data about the amount of water involved in manufacturing various products and how water use varies from state to state and from one region of the world to another. They think about how they depend on water being readily available in other parts of the world.
2	Investigate	Gather Knowledge	5	*Activity 1*—"Reservoir Roulette: A Journey Through the Water Cycle."	*Activity 1*—Students review pathways that a water molecule can take when cycling through Earth's systems. They think about the points in the water cycle where humans can access freshwater and about the ways that humans may affect this freshwater supply.
			6	*Activity 1*—Have students discuss their journeys and discuss *Analysis* questions.	
			7	*Reading*—"The Unique Qualities of Water." Discuss *About the Reading* questions.	
			8	*Activity 2*—"Where's the Drinking Water?" Part A: "Modeling a Watershed"	*Activity 2*—Part A: Students use models to investigate the principle sources of drinking water within Earth's systems. They model how surface water collects within watersheds, forming valuable surface water reservoirs, and think about how factors such as the size of a watershed can affect the availability of water.
			9	*Activity 2*—"Where's the Drinking Water?" Part B: "Groundwater Model"	*Activity 2*—Part B: Students model how groundwater collects in aquifers and is tapped with water wells. They think about the factors that affect the availability of groundwater supplies in a region.
			10	*Activity 2*—Discuss Part B Analysis questions. *Reading*—"Capturing the Good Water." Discuss *About the Reading* questions.	
3			11	*Activity 3*—"Water Supply Case Studies." Introduce, begin student research.	*Activity 3*—Students are assigned individual case studies about community water supplies in China, Japan, Brazil, Cyprus, Canada, Kenya, and Australia. They research and share what they have learned about how these communities obtain their water and the challenges that they face.
			12	*Activity 3*—Continue student research, and prepare students to share findings.	
			13	*Activity 3*—Share findings, discuss *Analysis* questions.	
			14	*Activity 4*—"Researching Your Water Supply." Introduce, begin student research.	*Activity 4*—Students design and follow a research strategy to learn about their water supply. As well as from Internet and library sources, they get information from local experts and state and federal personnel to determine where their water comes from and potential threats to their local supply.
			15	*Activity 4*—Student research.	
4		Address the Challenge	16	Write report	*Address the Challenge*—Students synthesize their research findings and write a report about their local water supply.

WEEK		DAY		PREVIEW
4	**Process**	17	*Share* findings. *Discuss* questions.	*Share*—Students share their findings about their local water source. They discuss and debate whether and what measures should be taken to protect their water supply. *Discuss*—Students review what they have learned by discussing their personal and local connections to water supply problems in other parts of the world, and how technology development can affect the availability of water supplies.
	Review	18	*Final Reading* and *Review*	
	Assessment	19	*Summative Assessment*	

Scope and Sequence - Chapter 3

The following is provided to help with your lesson planning. Adjust it according to the needs and interests of your classroom, and whether you assign readings as homework or complete them in class.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter, and discuss *Brainstorming* questions	Students discuss their experiences with the ocean and brainstorm about the ways that ocean water moves and how the properties of ocean water vary. They reconsider their initial ideas about whether a raft in the middle of the ocean would drift in a predictable direction.
			2	*Task*—"Ocean Quiz Show"	Students refresh their basic background knowledge of the oceans.
			3	*What's the Story*—"A Crazy Idea"	Students read a true story about Thor Heyerdahl, who planned to try to cross the Pacific on a primitive raft. They think about the forces that might propel his raft, and discuss their initial thoughts about his chances of success.
	Investigate	Gather Knowledge	4	*Activity 1*—"The Effect of Wind on Ocean Currents"	Students begin to gather knowledge about the science behind Heyerdahl's idea by using a model ocean basin to investigate the effect of wind on water movements.
			5	*Activity 2*—"Natural Patterns"	Students relate their observations of wind-driven currents to patterns of warm and cool surface ocean currents on a world map.
2			6	*Reading*—"Patterns in Surface Ocean Currents"	Students read about the major patterns in the flow of surface ocean currents and consider the flow of gyres, the movements of warm and cool currents, and the speed and volume of water flow in currents. They study an image of ocean surface temperatures, identify major currents on the map, and hypothesize about the effect of these currents on the climate of coastal areas. They begin to think about the type of current that is present off the coast of Peru that might carry Heyerdahl's raft toward Polynesia.
			7	*Activity 3*—"The Effect of Density on Ocean Currents"	Students model the effect of variations in density on water movements, and relate their observations to the movement of water in actual ocean currents.
			8	*Reading*—"Striving for Equilibrium"	Students gather more information from a reading about the forces that drive surface and deep ocean currents, the factors that influence flow directions, and how the Sun provides the energy that drives these currents. They read about how deepwater formation areas drive the global conveyor belt, which connects all of Earth's oceans in a global circulation.
		Address the Challenge	9	Prepare newspaper feature article	Students synthesize what they have learned about ocean currents and communicate their understanding by writing a newspaper feature article. This article educates the public about the science behind Heyerdahl's idea. An accompanying editorial states whether or not the student personally would be willing to join Heyerdahl on the raft Kon-Tiki.
	Process		10	*Share*—"Take-A-Stand" *Discuss*	Students share their views about the Kon-Tiki crew's chances of survival and their own willingness to take the risk. Students discuss what they have learned about ocean currents. They share their ideas about how the currents affect them, as well as the consequences if the flow direction of a major ocean current changes.
3	**Extend**		11	*Reading*—"The Peru Current"	Students learn more about the Peru Current and its relationship to one of the richest marine ecosystems in the world. They explore how the flow of this current is disrupted by periodic El Niño events and about the far-reaching effects of associated changes in global atmospheric and ocean circulation.
			12	*Activity 4*—"An Influential Current" Student research	They research how El Niño events have affected the United States and their local region, and whether an El Niño event is likely to occur in the near future.
			13	*Activity 4*—"An Influential Current"	Discuss *Analysis* questions, and begin review
	Assessment		14	*Summative Assessment*	

Scope and Sequence - Chapter 4

The following is provided to help with your lesson planning. Adjust it according to the needs and interests of your classroom, and whether you assign readings as homework or complete them in class.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter and discuss *Brainstorming* questions	Students brainstorm about their initial ideas about the difference between weather and climate, how their local climate compares to other regions of the world, and about the factors that affect regional climate.
			2	Read/discuss *Story* Introduce *Challenge*	Students read about Alexander Von Humboldt, an influential scientist born in the 18th century, who explored and documented plant, animal, and physiographic features in different regions of the world. They think about the importance of documenting scientific observations and about the benefits of travel.
	Investigate	Gather Knowledge	3	*Activity 1*—"Looking at Climate Data"	Students look at temperature and precipitation graphs for Arizona and New Hampshire over a >100-year period, and think about the relationship between year-to-year fluctuations in weather conditions and long-term climate trends. They obtain and analyze climate data from their local region and chosen travel destination, and think about how the differences are reflected in their landscapes.
			4	*Activity 2*—"Observing Landscapes"	Students compare and contrast photographs of the landscapes in Earth's major biomes and relate their observations to differences in regional climate. They explore how plants and animals are adapted to thrive in certain climate conditions, and hypothesize about how these organisms might be affected if the climate changed. They obtain photographs of the landscape in their chosen travel destination and compare them to the various biomes.
			5	*Activity 3*—"Looking for Patterns in a World Climates Map"	Students study a world climates map, looking for patterns and thinking about the factors that influence the distribution of world climates.
2			6	*Reading*—"Sharing the Warmth"	Students read about how latitude and general patterns of atmospheric circulation affect the regional climate distribution.
			7	*Activity 4*—"Comparing the Heat Capacity of Different Materials"	Students learn about the difference in heat capacity of land versus water. They think about how proximity to the ocean affects coastal and inland climates.
			8		
			9	*Activity 5*—"Interactions Between Ocean and Atmosphere"	Students compare climate data for inland and coastal communities, and speculate about the reasons for the differences.
			10	*Reading*—"Wind and Mountains"	Students read about the influence of prevailing winds, land features, and elevation on regional climates.
3		Address the Challenge	11	Prepare presentation about travel destination	Students prepare a presentation that compares the climate in their local area and travel destination, and relates these differences to factors such as latitude, oceans, prevailing winds, elevation, and land features.
	Process		12	*Share* presentations	Students share their presentations about their local area and travel destination with the rest of the class.
			13	Finish presentations *Discuss*	*Students discuss their personal connections to climate and think about how changes in climate can affect communities.*
	Review		14	*Review*	
	Assessment		15	*Summative Assessment*	

Scope and Sequence - Chapter 5

The following is provided to help with your lesson planning. Adjust it according to the needs and interests of your classroom, and whether you assign readings as homework or complete them in class.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter, and discuss *Brainstorming* questions	Students brainstorm about what they know from the media and previous science classes about climate change.
			2	Read/discuss *What's the Story*—"Washing Away" Introduce *Challenge*	Students read the story, which describes a community in Kivalina, Alaska, that is feeling the effects of global warming and wondering what the future holds for its families and their homes.
	Investigate	Gather Knowledge	3	Read/draw diagram/discuss *Reading*—"Following the Path of Light Energy"	Students use information in a reading to draw a diagram that shows what happens to the energy that is transmitted to Earth from the Sun. They also think about how the amount of light energy absorbed by Earth might vary from one region of Earth to another.
			4	*Activity 1*—"The Greenhouse Effect"	Students learn about the greenhouse effect and study data to compare Earth's energy balance to that of Venus.
			5	*Activity 2*—"The Albedo Effect" Part A: Studying Images of Earth	Students design and carry out an experiment to prove that light-colored surfaces reflect more light energy than dark surfaces and develop hypotheses about the relative albedo of various Earth surface materials based on images of Earth from space.
2			6	*Activity 2*—"Part B: Albedo Experiment"	
			7	*Activity 2*—"Part B: Albedo Experiment"	
			8	*Activity 3*—"Moving Carbon Around"	Students investigate in experiments and with molecular models how carbon atoms are transferred between rocks and the atmosphere.
			9	*Activity 4*—"Calling All Carbons"	Students explore the carbon cycle by analyzing information about processes by which carbon is transferred from one reservoir to another.
			10	*Reading*—"The Greenhouse Effect, the Carbon Cycle, and Feedback Loops"	Students read about feedback loops and think about how negative and positive feedback loops affect Earth's climate.
3		Address the Challenge	11	Prepare presentation for jury	Students prepare for a community meeting to discuss the future of Kivalina, Alaska.
	Process		12	*Share*—Present arguments	
			13	*Discuss*	
	Review		14	*Review* (including concept map, part of *Discuss*)	
	Assessment		15	*Summative Assessment*	

Scope and Sequence - Chapter 6

The following is provided to help with your lesson planning. Adjust it according to the needs and interests of your classroom, and whether you assign readings as homework or complete them in class.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter and discuss *Brainstorming* questions	Students brainstorm what they know about Earth's history—in particular, the Cretaceous Period in which dinosaurs lived and the Pleistocene Ice Age. They think about how climate could have been so much colder during the Pleistocene and about ways that studying climate change in Earth's history could help humans better understand climate change that is happening now.
			2	Read/discuss *What's the Story*—"Journey to a Different Time" Introduce *Challenge*	Students read a story about a very warm point in Earth's history when no polar ice caps existed and a very cold point in Earth's history when ice covered much of North America. They think about what might have caused Earth's climate to change so dramatically in the past and what might cause the climate to change now and in the future.
2	**Investigate**	Gather Knowledge	3	*Activity 1*—"Looking for Clues to the Past"	Students practice looking for evidence of events that have happened in the past by looking for clues around the classroom.
			4	*Reading*— "Evidence of Earth's Past"	Students read about climate proxies—tools used by scientists to investigate Earth's climate history. They summarize what they have learned and think about the importance of collecting climate proxy data from different locations around Earth.
			5	*Activity 2*—"Using Climate Proxies"	Students use simulated proxy data from sediment cores to determine past ocean temperatures.
			6	*Activity 3*—"Investigating How Orbital Changes Have Affected Past Climate"	Students use a model Earth and Sun to demonstrate the Milankovitch cycles and think about how these orbital cycles affect the intensity of Earth's seasons and in turn the advance and retreat of ice sheets during the Pleistocene.
			7	*Reading*—"The Carbon Cycle, Cretaceous Breadfruit Trees, and the Long Slide to the Cretaceous"	Students read about how plate tectonic movements occurring over very long periods of time have led to warm and cool periods in Earth's history. They think about how climate change in the past is relevant to Earth's future.
			8	*Reading*—"How Fast Can the Climate Change?"	Students read about abrupt climate change events that have occurred in Earth's history and the potential causes of these events.
			9	*Activity 4*—"What's Happening Now and What's Projected for the Future," Part A	Students study the predictions of global climate models and relate them to observed changes in global temperature, sea-level rise, ice measurements, ocean acidification and precipitation.
			10	*Activity 4*—"What's Happening Now and What's Projected for the Future," Part B	
3		Address the Challenge	11	*Reading*—"Sorting Out Natural and Human-Induced Climate Change	Students read about how scientists use their understanding of Earth's climate history to assess whether climate change happening now is due to natural processes or human activities. They summarize evidence that human activities are contributing to the current warming trend.
			12	*Address the Challenge:* Create Museum Exhibit	Students prepare museum exhibits that explain the key concepts they studied in this chapter.
	Process		13	*Share* exhibits	Students share their museum exhibits and review the major concepts covered in this chapter.
			14	*Discuss* concept mapping	Students discuss how their ideas about climate have changed since the beginning of the unit and review the complex factors that can bring about climate change by creating a concept map that relates the various terms and phrases used in this chapter.
	Review		15	Review	
	Assessment		16	Summative Assessment	

Scope and Sequence - Chapter 7: Mid-Year Challenge

The following is provided to help with your lesson planning. Adjust it according to the needs and interests of your classroom, and whether you assign readings as homework or complete them in class.

WEEK		DAY		PREVIEW
1	**Final Performance Assessment**	1	Introduce *Mid-Year Challenge* *Task*—"Bogus or Believe It?"	Students assess various scenarios that predict the future impacts of continued global warming and decide whether they are fact or fiction.
		2	*Address the Challenge*—Prepare news story (live, video, blog, written)	Students use the knowledge they have gained during this course to make predictions about what Earth will be like in the year 2100.
		3		
		4	*Share*	

Scope and Sequence - Chapter 8

The following is provided to help with your lesson planning. Adjust it according to the needs and interests of your classroom, and whether you assign readings as homework or complete them in class.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter and discuss *Brainstorming* questions	Students brainstorm what they know about the objects that make up the solar system and universe.
			2	*What's the Story?—"Meteorites: 'Scientific Gold'"*	Students read about Alexander Von Humboldt, an influential scientist born in the 18th century, who explored and documented plant, animal, and physiographic features in different regions of the world. They think about the importance of documenting scientific observations and about the benefits of travel.
	Investigate	Gather Knowledge	3	*Activity 1*—"The Dating Game"	Students learn about how scientists determine the age of rocks based on the relative amounts of radioactive "parent" isotopes and their stable "daughter" nuclei.
			4	*Reading*—"The Life Cycles of Stars"	Students read about the life cycles of stars and how they produce the heavy elements found in planets.
			5	*Activity 2*—"Solar System Census"	Students examine information on a deck of cards to look for patterns in physical and dynamical properties of the constituent bodies of the solar system. Students also discover some "exceptions to the rules" they have identified. They begin to think about how a successful formation theory must be able to explain all of these features of the present-day solar system.
2			6	*Reading*—"Solar Nebula Condensation Theory"	Students read about the solar nebula condensation theory and think about whether what they've read supports or contradicts the patterns they discovered in Activity 2.
			7	*Activity 3*—"Model of a Spinning Nebula"	Students construct a simple model of the solar nebula that is believed to have been the birthplace of the solar system.
			8	*Activity 4*—"Explaining Patterns of Motion with Kepler's Laws of Motion"	Students learn about Kepler's laws of motion for orbiting bodies and practice creating and analyzing ellipses.
		Address the Challenge	9	Prepare to present case	Students prepare to act as expert witnesses in a mock trial in defense of the solar nebula condensation theory of solar-system formation. They think about how to reconcile irregularities and inconsistencies that might threaten the validity of the current leading theory of solar systems' origins.
	Process		10	*Share* student presentations	Students present their cases to their classmates.
3			11	*Discuss*	Students discuss whether any group was unable to successfully defend the solar nebula condensation theory beyond reasonable doubt and whether they think there might be a more successful alternative theory for solar-system formation.
	Extend		12	*Activity 5*—"Spectroscopy"	Students learn about spectroscopy, the technique astronomers use to separate light received from distant objects into its component wavelengths, and how patterns in the light reveal information about an object's color, temperature, and composition.
	Review		13	*Review*	
	Assessment		14	*Summative Assessment*	

Scope and Sequence - Chapter 9

The following is provided to help with your lesson planning. Adjust it according to the needs and interests of your classroom, and whether you assign readings as homework or complete them in class.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter and discuss *Brainstorming* questions (includes drawing a diagram)	Students create an initial sketch that conveys their current knowledge about Earth's interior and think about ways one can "see" inside something without actually seeing it.
			2	*What's the Story?*—"Burrowing to the Depths"	Students read a story about two science fiction authors who wrote novels about journeys into Earth's interior. They think about what they would need to learn about Earth to write a science fiction story that conveyed accurate information about what the planet's interior is really like.
			3	*Task*—"Thinking on a Planetary Scale"	Students develop a comparison to help them understand the large scale of Earth.
2	**Investigate**	Gather Knowledge	4	Introduce *Challenge* *Reading*—"A Dense Interior"	Students read about how Newton calculated Earth's density and how this proved the planet's interior couldn't be hollow. They learn about how gravitational differentiation caused Earth to have a layered structure with the densest materials in the core.
			5	*Activity 1*—"Modeling Earth's Interior Structure"	Students construct scale models of Earth's interior, consulting expert information.
			6	*Activity 1*—"Modeling Earth's Interior Structure"	
			7	*Activity 2*—"See What You Can't See"	Students use aluminum cans filled with different substances to investigate how scientists use waves to explore Earth's interior.
			8	*Reading*—"How Do Scientists Explore Earth's Interior?"	Students learn about scientific techniques for exploring Earth's interior without actually going there.
			9	*Activity 3*—"Body Waves"	Students use their bodies to model two types of seismic waves that allow scientists to determine the properties of materials within Earth.
			10	*Activity 4*—"Locating an Earthquake Epicenter"	Students analyze seismograms to determine the epicenter of an earthquake.r.
3			11	*Reading*—"Energy in Earth's Interior"	Students read about the sources of thermal energy in Earth's interior and how the transfer of heat through convection in the mantle drives plate motion on the surface.
		Address the Challenge	12	Write science fiction story	Students synthesize what they have learned by designing a robotic vehicle that could survive the conditions within Earth and writing a science fiction story about a journey to Earth's core that conveys accurate scientific information about what Earth's interior is really like.
	Process		13	*Share* and *Discuss*—depending on how much is shared, could take additional day(s)	Students share portions of their stories with the rest of the class. Students discuss what they have learned about the nature of the materials and sources of energy within Earth, and about the methods scientists have devised to study Earth's interior.
	Review		14	*Review*	
	Assessment		15	*Summative Assessment*	

Scope and Sequence - Chapter 10

The following is provided to help with your lesson planning. Adjust it according to the needs and interests of your classroom, and whether you assign readings as homework or complete them in class.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter and discuss *Brainstorming* questions	Students discuss what they know about earthquakes.
			2	*What's the Story?—"Waves of Destruction"* *Challenge*—"Will Another Large Earthquake Happen in California?"	Students read about the 1906 San Francisco earthquake and summarize the observations of eyewitnesses.
	Investigate	Gather Knowledge	3	*Reading*—"Clues in the Landscape"	Students learn about some of the methods scientists use to study the origin of earthquakes. They develop an initial hypothesis about what causes earthquakes based on measurements taken right after the 1906 quake. They think about their current understanding of faults and how faults are related to earthquakes.
			4	*Activity 1*—"Using GPS Data and Geologic Markers to Track Plate Motion"	Students use data from GPS measurements and bedrock exposures from locations adjacent to the San Andreas Fault to measure the relative movement of the North American and Pacific Plates.
			5	*Activity 2*—"Looking for Patterns in a World Map"	Students study a world map of earthquake locations over an eight-year period and look for patterns that may explain why earthquakes happen.
2			6	*Reading*—"What Do Tectonic Plates Have to Do with Earthquakes?"	Students learn about the relationship of plate movements and earthquakes.
			7	*Activity 3*—"What Is Happening Along the San Andreas Fault?" Part A: Your Initial Model	Students construct working physical models of the San Andreas Fault zone and use them to simulate earthquakes.
			8	*Activity 3*—"What Is Happening Along the San Andreas Fault?" Part B: What Does the Real San Andreas Fault Look Like?	
			9	*Reading*—Measurements and Computer Models" *Activity 4*—"Studying Earthquake Computer Models"	Students learn more about the types of field observations and measurements that scientists make to study earthquakes, and how computer models have helped.
			10	*Activity 4*—"Studying Earthquake Computer Models"	Students study computer models that simulate earthquakes and forecast when and where earthquakes will happen along the San Andreas Fault zone.
3		Address the Challenge	11	*Activity 4*—"Studying Earthquake Computer Models Introduce five-paragraph essay	Students write an essay describing and supporting their personal conclusion about the likelihood of another large earthquake striking California.
	Process		12	*Share*	Students share their conclusions and supporting evidence with classmates.
			13	*Discuss*	Students discuss the challenges of earthquake forecasting and the best way for people living in earthquake-prone areas to prepare for possible future earthquakes.
	Review		14	*Review*	
	Assessment		15	*Summative Assessment*	

Scope and Sequence - Chapter 11

The following is provided to help with your lesson planning. Adjust it according to the needs and interests of your classroom, and whether you assign readings as homework or complete them in class.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter and discuss *Brainstorming* questions	Students discuss their current knowledge of volcanoes—where they are found and why, what makes them erupt, why some are active and others extinct—and their own willingness to live near a volcano. They draw a diagram of what they think it looks like under volcanoes and what happens when they erupt.
			2	*What's the Story?*—"A Hazardous Development?" Introduce *Challenge*	Students read about a planning-board meeting in which a developer presents a plan to build a new town near Mount Rainier. They consider the potential hazards of building homes near a volcano.
2	**Investigate**	Gather Knowledge	3	*Reading*—"Could Mount Rainier Erupt?"	Students learn some basics about volcanoes and their relationship to subduction zones.
			4	*Activity 1*—"Detecting a Subducting Plate"	Students use earthquake data to map what is beneath the surface near an oceanic trench.
			5	*Activity 2*—"A Lava Flow or An Explosion?"	Students model, compare, and contrast the eruptions of shield volcanoes and stratovolcanoes.
			6	*Activity 3*—"What Might an Eruption of Rainier Be Like?"	Students research the 1980 eruption of Rainier's neighbor, Mount St. Helens. They take note of the signals coming from the mountain that indicated an eruption was imminent. They also consider what the St. Helens eruption tells us about possible future events at Mount Rainier.
			7		
			8	*Activity 4*—"How Do Scientists Monitor Volcanoes?"	Students work as groups of specialists to research the instruments and technologies scientists have developed to 1) monitor for earthquakes that signal magma movement beneath the surface of volcanoes; 2) measure ground deformation on the surface of a volcano, also due to magma movement; or 3) measure temperature changes and gas emissions from accumulating magma. They develop presentations including demonstrations and/or 3-D models to teach others in the class about the monitoring techniques within their group's assigned specialty area.
			9		
3			10	*Reading*—"Has Rainier Erupted in the Past?"	Students learn how scientists study the remnants of past volcanic eruptions to look for patterns: how often the volcano typically erupts, what the eruptions were like, and how far the erupted materials extended from the mountain. They think about how the patterns in these data might help scientists predict the timing and nature of future eruptions.
			11	*Activity 5*—"Monitoring Mount Rainier"	Students study graphic diagrams showing data from seismographs located on Mount Rainier, which detect earthquake activity beneath the mountain. They look at data from the past 10 years, and more recent monitoring data available for Mount Rainier on the Cascades Volcano Observatory (CVO) website. They answer questions that encourage them to think about the likelihood that this volcano will reawaken.
		Address the Challenge	12	Prepare presentation about travel destination	Students prepare a presentation that compares the climate in their local area and travel destination, and relates these differences to factors such as latitude, oceans, prevailing winds, elevation, and land features.
	Process		13	*Share* *Discuss* Finalize letters	Students participate in a Take-A-Stand activity in which they physically arrange themselves along a continuum in the classroom according to how they feel about approving the development near Rainier and about living near the volcano themselves. Students discuss the challenges of predicting a volcanic eruption and explain their thinking about whether or not the volcanoes of the Cascade Range could erupt. They revise and finalize their position papers with recommendations about the development, based on what they have learned about volcanoes in this chapter.

WEEK		DAY		PREVIEW
3	**Extend**	14	*Reading*—"How Do Convergent Boundaries Shape Earth's Surface Features?"	Students learn about the processes that occur and surface features that form at other convergent boundaries around the world.
		15	*Activity 6*—"Features Along Convergent Boundaries"	Students research an assigned topic related to physical features or hazards associated with convergent boundaries around the world.
4		16	*Activity 6*—"Features Along Convergent Boundaries"	They share these posters with their classmates and synthesize their understanding of the processes that occur along convergent boundaries
	Review	17	*Final Reading*—"Convergent Boundaries" *Review*	
	Assessment	18	*Summative Assessment*	

Scope and Sequence - Chapter 12

The following is provided to help with your lesson planning. Adjust it according to the needs and interests of your classroom, and whether you assign readings as homework or complete them in class.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter and discuss *Brainstorming* questions	The teacher facilitates a discussion to determine students' initial familiarity with geographic features and changes taking place on the seafloor.
			2	*What's the Story?*—"An Explorer with Big Ideas" " Introduce *Challenge*	Students read about Alfred Wegener's theory of continental drift and why it wasn't initially accepted by scientists. They discuss their initial ideas about how the Atlantic Ocean formed and how it might change in the future.
	Investigate	Gather Knowledge	3	*Activity 1*—"Using Sound Waves to Map an Ocean Floor"	Students use sound-wave travel times to plot bathymetric profiles of the ocean floor, and then they transfer the same data to create a depth map of the ocean floor.
			4	*Reading*—"Into the Depths"	Students learn about how huge chains of undersea mountains and volcanic activity were discovered on the ocean floor. They think about what could be causing volcanic activity on the seafloor.
			5	*Activity 2*—"Studying Maps of Earth's Oceans"	Student groups study maps of the seafloor showing topography, earthquake locations, ocean crust age data, and plate boundaries, and look for patterns. They develop hypotheses relating these patterns to the processes that may have formed them.
2			6	*Activity 2*—"Studying Maps of Earth's Oceans" Reading—"The Missing Piece of the Plate Tectonics Puzzle"	Students learn about Harry Hess's seafloor spreading theory and how modern technologies have enabled scientists to gather the evidence that led to the development of this idea.
			7	*Activity 3*—"Plotting a Magnetic Map of the Ocean"	Students apply data in creating a magnetic map of the ocean, describe the patterns they see in this map, and relate these patterns to the processes that occur along rift zones.
			8	*Activity 4*—"How Are Ocean Basins Formed by Seafloor Spreading?"	Students build a simple model from index cards to help them understand how oceans are formed by seafloor spreading.
		Address the Challenge	9	Begin research of rift zone	Students construct models of actual rift zones at locations around the world.
			10	Research and build rift zone model	
3	**Process**		11	*Share* models	Students share their models of rift zones with their classmates.
			12	*Discuss*	Students discuss what they have learned about the development of a scientific theory and think about how Earth's surface has been shaped by plate tectonics.
	Extend		13	*Reading*—"Pulling It All Together—Earth's Machinery"	Students read a summary description of the types of plate movements that occur and physiographic features that form at divergent, convergent, and transform boundaries. They pull together what they have learned in this unit by studying a labeled diagram of features relating to plate tectonics and describing how Earth is moving and changing at divergent, convergent, and transform boundaries.
	Review		14	*Review*	
	Assessment		15	*Summative Assessment*	

Scope and Sequence - Chapter 13

The following is provided to help with your lesson planning, and should be adjusted according to the needs and interests of your classroom, and the tasks and readings you assign as homework.

WEEK			DAY		PREVIEW
1	Consider		1	Introduce chapter and discuss *Brainstorming* questions	The teacher facilitates a discussion to determine students' initial familiarity with the role of rivers in changing Earth's landscape.
			2	*What's the Story?*—"Flooding the Big Easy" *Challenge*—"Why Is New Orleans Sinking?"	Students read about the flooding of New Orleans during Hurricane Katrina and learn that much of the land is below sea level and is sinking. They consider the changes to New Orleans and the delta to its south, and consider what could be causing the land to sink.
	Investigate	Gather Knowledge	3	*Activity 1*—"Modeling River Deposits"	Students make a sediment column that shows how sediment carried by river water settles and is sorted when water slows down.
			4	*Reading*—"How Do Rivers Build Land?"	Students learn about how rivers erode sediment from their drainage basins, transport it, deposit it at the river mouths, and build land. They consider how changes in the speed of water affect the amount and type of sediment it can carry.
			5	*Activity 2*—"Modeling a River Delta"	Students use a mini stream table model to observe the movement of sediment by a river and the formation of a delta. They then relate their observations of erosion and deposition to actual rivers.
2			6	*Activity 3*—"What Does a Real Delta Look Like?"	Students examine satellite images of deltas around the world, investigating how differences in sediment load and the movement of river and ocean water affect the way in which rivers build land. They study a satellite image that shows parts of the entire drainage basin of the Ganges River, from its upper course in the Himalayas to its delta in the Bay of Bengal.
			7	*Reading*—"Layer by Layer"	Students read about how rivers build land over long periods of time and examine evidence that the Mississippi River has naturally switched paths many times in the past.
			8	*Activity 4*—"A View Beneath the Surface"	Students construct stratigraphic columns based on actual soil-boring data from along one of the canals that breached during Hurricane Katrina. They then use the stratigraphic columns to create a cross section showing the layers that were deposited beneath this area of New Orleans over the past few thousand years and interpret the environments that must have existed there in the past.
			9		
			10	*Reading*—"Why Is the Mississippi Delta Region Sinking?"	Students read about how sediments carried to the mouth of the Mississippi River over millions of years piled up to great thicknesses and built land into the Gulf of Mexico.
3			11	*Activity 5*—"Settling Sediments"	Students investigate natural processes that account for the subsidence of New Orleans. They use moist sand to model the process of compaction and examine sedimentary rocks.
			12	*Reading*—"Have People Played a Role in the Subsidence of New Orleans?"	Students consider human interventions in river processes that may contribute to the subsidence of New Orleans. They read about the creation of dams, channels, and levees, and the diminishing amounts of sediment reaching the Mississippi Delta.
		Address the Challenge	13	Prepare five-paragraph written essay	Students address the challenge by writing a five-paragraph paper explaining to the people of New Orleans why the land is sinking and include recommendations about the rebuilding of the city.

WEEK		DAY		PREVIEW
3	**Process**	14	*Share*	Students take and defend a position regarding whether or not they would be comfortable living in the parts of New Orleans that were devastated during Katrina.
			Discuss	Students discuss the benefits and disadvantages of human interventions with a river, the potential impact of global warming on the New Orleans area, and the role that science plays in assessing and reducing the risk of natural disasters.
	Review	15	*Final Reading* and *Review*	
4	**Assessment**	16	*Summative Assessment*	

Scope and Sequence - Chapter 14

The following is provided to help with your lesson planning, and should be adjusted according to the needs and interests of your classroom, and the tasks and readings you assign as homework.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter and discuss *Brainstorming* questions	Students brainstorm about what they already know about the crust—what it is made of and how it varies from place to place. They draw a cross-sectional diagram of what they think the crust looks like beneath the school.
			2	*What's the Story?*—"A Curious Mind" *Task*—"Investigating Samples of the Crust"	Students read about James Hutton, a man who spent many hours observing the crust around his farm in Scotland. The ideas he developed from his investigations have profoundly changed people's views of Earth's history.
			3	*Task*—"Investigating Samples of the Crust"	Students make their own observations of Earth's crust by collecting and studying samples, and reviewing photographs from around the world. They develop questions about Earth's crust based on their observations.
			4	*Task*—"Investigating Samples of the Crust" Introduce *Challenge*	
2	**Investigate**	Gather Knowledge	5	*Reading*—"Elements of Earth's Crust "	Students learn about the elements composing Earth's crust and about how differences in composition cause oceanic crust to be denser than continental crust.
			6	*Activity 1*—"Can Rocks Really Have Different Densities?"	Students design and perform measurements to prove that rocks can have different densities.
			7	*Reading*—"Minerals—The Building Blocks of Earth's Crust"	Students read about minerals, the building blocks of Earth's crust. They practice recognizing what is and is not a mineral.
			8	*Activity 2*—"Identifying Minerals by Their Physical Characteristics"	Students develop their scientific skills by identifying mineral samples by the samples' physical characteristics.
			9	*Activity 3*—"Clues in the Rock-Forming Process"	Students study rock samples and learn how the locations where the rocks are found provide clues to Earth's history.
		Address the Challenge	10	Prepare letter to the planning board	Students study images of rock outcroppings from two locations and use their knowledge of rock-forming processes to write the story that these images tell.
3	**Process**		11	*Share* student presentations	Students share their ideas about the images of Earth's crust and the stories they tell. Through discussion with their classmates, they develop their ideas further.
				Discuss	Students discuss the types of clues by which geologists decipher past events in Earth's history.
	Extend		12	*Reading*—"Piecing Together Earth's History"	Students learn about how clues in rock layers are used to determine the relative and absolute age of rocks.
			13	*Activity 4*—"Timeline of Major Events in Earth'sHistory"	Students test their knowledge of Earth's history by constructing a timeline of major events.
	Review		14	*Review*	
	Assessment		15	*Final Assessment*	

Scope and Sequence - Chapter 15

The following is provided to help with your lesson planning, and should be adjusted according to the needs and interests of your classroom, and the tasks and readings you assign as homework.

WEEK			DAY		PREVIEW
1	**Consider**		1	*Brainstorming*	Students brainstorm about their understanding of what the objects around them are made of and where these materials came from.
			2	*What's the Story?*—"Pikes Peak or Bust: 1859" *Task*—"What Makes a Metal, Rock, or Mineral Valuable?"	• Students read a story about a prospector who finds gold in a mountain stream. They begin to think about why mineral resources are valuable and how to obtain them. • Students explore what makes certain minerals valuable, investigate the useful properties of some metals ,and review facts and figures about the quantities of rocks, minerals, and minerals they use in their lifetime.
	Investigate	Gather Knowledge	3	Introduce *Challenge*	Students gain expertise in the ways that mineral deposits form within Earth and, preparing a physical demonstration, share this information with their classmates.
			4	*Activity 1*—"Where Are the Mineral Ores?"	
			5	*Activity 2*—"Prospecting for Mineral Ore"	Students perform chemical tests and search for a layer of rock that contains the valuable mineral molybdenum.
2			6	*Reading*—"From Rocks to Riches—Mining and Processing Mineral Ore"	Students learn about how mineral ores are found, mined, and processed to make useful materials. They think about the costs of using mineral resources in terms of energy use and environmental impacts.
			7	*Activity 3*—"Refining an Ore"	Students perform a two-part process to refine copper from malachite.
		Address the Challenge	8	Research business plan	Students develop a business plan that describes how they would develop and market a mineral resource. They apply the knowledge gained in this chapter to research why people want this material. They propose a strategy for finding the mineral ore and describe how the ore forms and how it is found, mined, and processed. They summarize this strategy in a handout, such as a brochure, and prepare to share their plans with their classmates.
			9	Write business plan and develop sales pitch	
	Process		10	*Share* business plans and sales pitches	Students share their business plans by presenting a brief sales pitch to their classmates. They are given the opportunity to invest in their classmates' plans.
3			11	*Discuss*	Students discuss the broader implications of society's dependence on mineral resources. They think about how mineral resources have allowed civilization to advance technologically, the true costs of extracting and using this natural resource, and the environmental impacts.
			14	*Final Reading*—"Ore from Earth"	Students read about and consider the impact of extracting ores from the Earth.
	Assessment		15	*Summative Assessment*	

Scope and Sequence - Chapter 16

The following is provided to help with your lesson planning, and should be adjusted according to the needs and interests of your classroom, and the tasks and readings you assign as homework.

WEEK			DAY		PREVIEW
1	**Consider**		1	Introduce chapter and discuss *Brainstorming* questions	Students brainstorm about the degree to which they depend on energy resources from Earth.
			2	*Task*—"Energy Connections"	Students develop their understanding of the importance of oil by completing the task Energy Connections, in which they evaluate data on the amount and sources of energy people use and how these energy sources have changed in human history. They create and share graphs of these data, and think about what the trends in these data might mean.
			3		
			4	*What's the Story?*—"The Mystery of Rub" al-Khali" Introduce *Challenge*	Students read about a remote desert region in Saudi Arabia that is underlain by a rich reservoir of oil. Students think about possible reasons there is oil in some parts of the world and not in others.
2	**Investigate**	Gather Knowledge	5	*Activity 1*—"How Do Oil Reservoirs Form?" Part I—"Oil Formation"	Students review information and use a physical model to investigate the processes by which oil forms and migrates into reservoirs within Earth.
			6	*Activity 1*—"How Do Oil Reservoirs Form?" Part II—"Oil Migration into Reservoirs"	
			7	*Activity 1*—"How Do Oil Reservoirs Form?" *Reading*—"A Convergence of Conditions—the Rub' al-Khali"	Students read about how the unique geologic history of the Middle East has resulted in the formation of giant oil reservoirs. They use their understanding of geologic processes that occur in Earth's crust to synthesize the reasons some areas of the world have more oil than others.
		Address the Challenge	8	Create educational display, newspaper article, web page, or video documentary	Students synthesize what they have learned by creating an educational display, news story, or documentary explaining why the Middle East has so much oil.
			9	Create educational piece	
	Process		10	*Share* educational piece	Students share their educational pieces, explaining the geologic processes that have resulted in an oil-rich Middle East.
3			11	*Discuss* (including concept mapping)	Students create a concept diagram that demonstrates their understanding of the processes that result in the accumulation of oil reservoirs. They discuss the likelihood that oil could become scarcer in the future and their ideas about the measures that could be taken to reduce U.S. dependence on foreign oil.
	Extend		12	*Reading*—"How Is Oil Found and Produced?"	Students learn about how oil is found and produced from oil reservoirs, and think about why oil is becoming more expensive to find and produce in the United States.
			13	*Activity 2*—"Exploration and Production Models"	Students design and construct a physical model to demonstrate knowledge that is critical to have if you hope to find and produce oil.
			14		
	Review		15	*Final Reading and Review*	
4	**Assessment**		16	*Summative Assessment*	

Scope and Sequence - Chapter 17: Final Challenge

The following is provided to help with your lesson planning, and should be adjusted according to the needs and interests of your classroom, and the tasks and readings you assign as homework.

WEEK		DAY		PREVIEW
1	**Final Performance Assessment**	1	Introduce *Challenge* *Reading*—"The Heartbeat of Earth"	Students review the sources of Earth's internal heat and the mechanisms by which it is cooling. They discuss their initial ideas about how Earth would be different if its interior cooled.
		2	*Activity*—"Digging for Answers"	Students perform a group activity to review their knowledge about processes within the geosphere and their relationships to Earth's internal heat. They consider how these processes might be affected if Earth were to cool completely.
		3	*Address the Final Challenge*	Students apply the knowledge they have gained during this course to prepare an essay or presentation predicting what Earth will be like when its interior cools completely.
		4	Prepare written essay or presentation	
		5	*Share/Discuss* students' ideas	