Unit Overview	
Content Area: Earth Science	
Unit Title: Weather and Climate	**Unit:** 3
Target Course/Grade Level: 6	**Timeline:**

Unit Summary:

What factors interact and influence weather and climate?

This unit is broken down into three sub-ideas: Earth's large-scale systems interactions, the roles of water in Earth's surface processes, and weather and climate. Students make sense of how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. A systems approach is also important here, examining the feedbacks between systems as energy from the Sun is transferred between systems and circulates though the ocean and atmosphere. The crosscutting concepts of cause and effect, systems and system models, and energy and matter are called out as frameworks for understanding the disciplinary core ideas. In this unit, students are expected to demonstrate proficiency in developing and using models and planning and carrying out investigations as they make sense of the disciplinary core ideas. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-ESS2-4, MS-ESS2-5, and MS-ESS2-6.

Learning Targets

NJSLS-Science

MS-ESS2-4	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. ESS2.C- Explain how variations in density result from variations in temperature and salinity drive a global pattern of interconnected ocean currents. ESS2.D- Use a model to explain the mechanisms that cause varying daily temperature ranges in a coastal community and in a community located in the interior of the country.
MS-ESS2-6	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Disciplinary Core Ideas

ESS2.C: The Roles of Water in Earth's Surface Processes

·Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4)

·The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5)

· Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)

·Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6)

ESS2.D: Weather and Climate

·Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)

·Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5)

The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)

Science and Engineering Practices

Developing and Using Models: Develop a model to describe phenomena (MS-ESS2-6)
Develop a model to describe unobservable mechanisms (MS-ESS2-4)

Planning and Carrying Out Investigations: Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions (MS-ESS2-5)

NJSLS Connections

Primary Interdisciplinary Connections:

English Language Arts/Literacy

- Support the analysis of science and technical texts by citing specific textual evidence for how the motions and complex interactions of air masses result in changes in weather conditions.
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with information that is gained from reading text about how the complex patterns of the changes and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents are major determinants of local weather patterns.
- Gather relevant information from multiple print and digital sources about how the complex patterns of the changes and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
- Include multimedia components and visual displays in presentations to clarify information about how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Mathematics

- Reason abstractly and quantitatively by using data such as weather maps, diagrams, and visualizations or obtained through laboratory experiments to predict weather within probabilities ranges.
- Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); Use positive and negative numbers to represent changes in atmospheric and oceanic temperatures, explaining the meaning of 0 in each situation.
- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

Unit Essential Questions	**Unit Understandings**
1. What are the processes involved in the cycling of water through Earth's systems? 2.What is the relationship between the complex interactions of air masses and changes in weather conditions? 3.What are the major factors that determine regional climates?	· Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. · Global movements of water and its changes in form are propelled by sunlight and gravity. · The cycling of water through Earth's systems is driven by energy from the sun and the force of gravity. Within Earth's systems, the transfer of energy drives the motion and/or cycling of water. • The motions and complex interactions of air masses result in changes in weather conditions. • The complex patterns of the changes in and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. • Examples of data that can be used to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions include weather maps, diagrams, and visualizations; other examples can be obtained through laboratory experiments. • Air masses flow from regions of high pressure to regions of low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time. • Because patterns of the changes and the movement of water in the atmosphere are so complex, weather can only be predicted probabilistically. • Sudden changes in weather can result when different air masses collide. • Weather can be predicted within probabilistic ranges. Cause-and effect-relationships may be used to predict changes in weather. • Unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. • Patterns of atmospheric and oceanic circulation that determine regional climates vary by latitude, altitude, and geographic land distribution. • Atmospheric circulation that, in part, determines regional climates is the result of sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds.

	• Ocean circulation that, in part, determines regional climates is the result of the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Models that can be used to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates can be diagrams, maps and globes, or digital representations.

Unit Learning Targets (Outcomes) – Formative Assessment
Students who understand the concepts are able to …

· Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

· Model the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle.

· Collect data to serve as the basis for evidence for how the motions and complex interactions of air masses result in changes in weather conditions.

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

Cross Cutting Concepts:

Cause and Effect
· Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)

Systems and System Models
· Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)

Energy and Matter
· Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)

Integration of Technology: Web-based textbook, interactive whiteboard, interactive texts, videos, digital board builder

Technology Resources: Discovery Education website,
http://www.teachoceanscience.net/teaching_resources/education_modules/observing_the_ocean/explore_ocean_physics/
https://aamboceanservice.blob.core.windows.net/oceanservice-prod/education/discoverclimate/noaa_complete_activity_book_111213.pdf

Opportunities for Differentiation: Differentiation and support tips, which includes suggestions for ELL, struggling students, and accelerated students, are available below the instructional practice section of each model lesson.

Teacher Notes:

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

Prior Learning- by the end of Grade 5, students understand that:

- Most of the Earth's water is in the ocean, and much of the Earth's freshwater is in glaciers or underground.
- Climate describes patterns of typical weather conditions over different scales and variations.
- Historical weather patterns can be analyzed.

Evidence of Learning

Summative Assessment

Climate and Factors That Affect It

1. Student groups build weather sensors in order to collect daily weather data (NOAA "Discover Your Changing World with NOAA: An Activity Book"
2. Complete the interactive activity, "Exploring Regional Climates" and the accompanying worksheet.
3. Weather Smart: Climate "Light or Dark?" and " Greenhouse in a Bag" outdoor hands-on activities and analysis questions.
4. Practice Assessment in Evaluate tab of Discovery Education website, Board Builder and/or Constructed Response, or other teacher designed assessment. Students should be able to: Describe the difference between climate and weather citing an example of each. Describe how water (ocean, lake, river) has a local effect on weather and climate and provide evidence. Describe how global patterns of wind such as the jet stream or ocean currents influence weather and climate of local regions. Describe how human impact can affect these patterns in a negative way.

Oceans & Climate

1. Density Current demonstration and there is a map with world ocean currents for the "Temperatures Around the World" hands-on activity
2. Students collect evidence from the Explore sessions, the videos and the Hands-on Lab to complete the Scientific Explanation Student Sheet (sections "Claim" and "Explanation"
3. Direct students to the Hands-On activity: Temperatures Around the World and accompanying analysis questions.
4. Optional Project #1 Ocean Currents Board
5. Optional Projects #2 Students can write a 5-minute skit about sea voyages through time.

6. Optional Projects #3 Students can design and carry out a laboratory investigation to model the effects of continents on the paths of ocean currents. They can present this as a demo to the class.
7. Optional Project #4 Students complete a current event or local news report about Cape May fisheries after reading the articles, "Fisherman's Wharf Tour Answers Some Fishy Questions" and "Fishing: More than just a hobby in Cape May".
8. Optional Project #5 Students complete the Constructed Response Changes in Ocean Salinity and Factors That Affect Climate. As described in the Teacher's Guide, have students view one of the following videos before answering the BCR question.

Equipment needed: Whiteboard, laptops, headphones, and hands-on materials for lessons

Teacher Instructional Resources (Hyperlinks):

Air Masses of a set of Level 1 activities designed by the Science Center for Teaching, Outreach, and Research on Meteorology (STORM) Project. The authors suggest that previous activities in the unit be completed before Activity 12: Air Masses, including those that address pressure systems and dew point temperature. In Activity 12, the students learn about the four main types of air masses that affect weather in the United States, their characteristic temperatures, and humidity levels as it relates to dew point temperatures. The lesson plan follows the 5E format. Initially, students discuss local weather and then examine surface temperature and dew point data on maps to determine patterns and possible locations of air masses. They learn about the source regions of air masses and compare their maps to a forecast weather map with fronts and pressure systems drawn in. During the Extension phase, students access current maps with surface and dew point temperatures at http://www.uni.edu/storm/activities/level1 and try to identify locations of air masses. They sketch in fronts and compare their results to the fronts map. Evaluation consists of collection of student papers.

Ocean Currents and Sea Surface Temperature allows students to gather data using My NASA Data microsets to investigate how differential heating of Earth results in circulation patterns in the oceans and the atmosphere that globally distribute the heat. They examine the relationship between the rotation of Earth and the circular motions of ocean currents and air. Students also make predictions based on the data to concerns about global climate change. They begin by examining the temperature of ocean's surface currents and ocean surface winds. These currents, driven by the wind, mark the movement of surface heating as monitored by satellites. Students explore the link between 1) ocean temperatures and currents, 2) uneven heating and rotation of Earth, 3) resulting climate and weather patterns, and 4) projected impacts of climate change (global warming). Using the Live Access Server, students can select data sets for various elements for different regions of the globe, at different times of the year, and for multiple years. The information is provided in maps or graphs which can be saved for future reference. Some of the data sets accessed for this lesson include Sea Surface Temperature, Cloud Coverage, and Sea Level Height for this lesson. The lesson provides directions for accessing the data as well as questions to guide discussion and learning. The estimated time for completing the activity is 50 minutes. Inclusion of the Extension activities could broaden the scope of the lesson to several days in length. Links to informative maps and text such as the deep ocean conveyor belt, upwelling, and coastal fog as needed to answer questions in the extension activities are included.

Adopt a Drifter: Do Ocean Surface Currents Influence Climate? Students construct climographs showing both precipitation and temperature for 3 coastal cities and describe how ocean surface currents affect climate on nearby land. They are provided with the research question, "Do ocean currents influence climate?" and are asked to construct a hypothesis. The students are asked to read an introductory paragraph explaining the relationship between the temperature of the ocean current and temperature and precipitation on adjacent land and examine a map of major ocean currents. They construct 3 climographs using data provided. The

labels on the graphs are not directly on the lines, so the teacher would need to instruct students on the placement of their data points. Conclusion and analysis questions are provided asking students to examine the direction of flow of ocean currents, temperature of the water, source regions of the current, and impact on both temperature and precipitation on coastal regions. Extension activities include researching additional information on vegetation, culture and physical geography of the 3 cities studied, plus comparing data for 2 additional cities. The activity should take 2 class periods.

Modifications

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

· Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

· Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

· Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

· Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

· Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

· Use project-based science learning to connect science with observable phenomena.

· Structure the learning around explaining or solving a social or community-based issue.

· Provide ELL students with multiple literacy strategies.

· Collaborate with after-school programs or clubs to extend learning opportunities.

· Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

ACTIVITIES	**MATERIALS**
Grades 6-8 Earth & Space Science Techbook **Course:** Earth Science **Unit:** Earth's Systems **Concept:** Climate and Factors that affect it	
Session 1 (Approx. 1 day) Lesson Questions: How is climate different from weather? What factors affect the climate of the region? How do the oceans affect climate?	video segment: What is the difference between climate and weather?

Introduction: Prior to lesson, it may be beneficial to review latitude and longitude concepts with class. Recommended optional activities include BrainPop and Discovery Ed videos for background info and variety of worksheets and a lat/long game (available in your Weather and Climate binder). Activate prior knowledge - Open session by asking students what the words "weather" and "climate" mean to them. (Refer to Model Lesson Session 1-Engage).	
Session 2: (Approx. 1 day): Lesson Question: How is climate different from weather? Refer to Model Lesson Session 2 (Engage) or view weather and climate powerpoint in shared folder and complete the foldable activity along with the powerpoint. Have a class discussion about differences between climate. Optional activity: Weather and climate sentence strip sort.	Weather and Climate Powerpoint available in shared Google drive folder video segment: What Is Climate? (1:45), Climate Review (0:58), Climate and Factors That Affect It
Session 3 and 4: (Approx. 2 days): Lesson Question: How is climate different from weather? Student groups build weather sensors in order to collect daily weather data (NOAA "Discover Your Changing World with NOAA: An Activity Book" (Activity 5-weather vane, barometer, rain gauge). Students work on Engage and Explore tab in Discovery Education individually or in partners. Students answer questions as they encounter them in DE Techbook and complete the interactive activity, "Exploring Regional Climates" and the accompanying worksheet. Students will then match pictures to the appropriate climate regions.	Wind Vane Materials: Adult prep needed prior to making 1 – Broomstick or long wooden dowel, about 1 inch diameter 1 – Aluminum baking dish, about 6 x 9 inches 1 – Wood stick, about 3/4 inch square and 12 inches long 1 – Nail, about 1 inch long 1 – Metal washer with a hole slightly larger than the nail Duct tape Scissors baking dish Ruler or tape measure Silicone or other glue that will stick to aluminum Leather gloves (Optional) Hand drill, and small drill bit slightly larger than the nail Barometer Materials: 1 – Ruler, about 30 cm (12 in) 1 – Clear drinking glass, glass jar, or other container with sides tall enough to support the ruler 1- Clear plastic drinking straw about 30 cm (12 in) long Clear tape - Modeling clay or chewing gum - (Optional) Food coloring, your choice of color Rain Gauge Material:

	• Straight-sided glass or plastic container, with a diameter of about two inches or less (such as an olive jar) • Coat hanger or wire bent to make a holding rack • Measuring spoons • Hammer and nails to secure the rack • Felt tip marker
Lesson Question: How do the oceans affect climate?**Session 5 (1 day):** Teacher Hands-On demonstration activity: "Effects of Warm Ocean Currents on Air Temperature". Directions need to be modified slightly and it may help a partner teacher or aide in the classroom to allow for set-up and analysis. Teacher Hands-On demonstration activity: "Effects of Warm Ocean Currents on Air Temperature".	Water Microwave Terrarium Thermometer Student worksheets
Session 6 and 7 (Approx. 2 days): Lesson Questions: How is climate different from weather? What factors affect the climate of the region? How do the oceans affect climate? Watch the "Climate" video on Discovery Ed (Approx. 15 min. total) and complete the Climate video packet. Also, revisit the vocab and the 8 statements so class can decide were they right or wrong about their definitions and statements about weather versus climate (From first session). Weather Smart: Climate "Light or Dark?" and " Greenhouse in a Bag" outdoor hands-on activities. (suggested groupings 2-4 students) Optional HW assignments: Read article, "Climate and Factors That Affect It: Dust" and then view videos. Create a 2-column chart for students to record what they learn and then discuss as a class. Earth Science Scott Forsman guided reading booklets: "Climate and Weather" and "Earth's Climate and Weather"	Thermometers Plastic bag Student worksheets Video: "Climate" 15 min. Article "Climate and Factors That Affect It" Booklets "Climate and Weather" and "Earth's Climate and Weather" Black and white construction paper
Session 8 (1 day): Lesson Question: How is climate different from weather? What factors affect the climate of the region? How do the oceans affect climate? Assessment: Practice assessment on the Evaluate tab, Board Builder and/or Constructed Response, or other teacher designed	Brief Constructed Response worksheet Board Builder

assessment. Students should be able to: Describe the difference between climate and weather citing an example of each. Describe how water (ocean, lake, river) has a local effect on weather and climate and provide evidence. Describe how global patterns of wind such as the jet stream or ocean currents influence weather and climate of local regions. Describe how human impact can affect these patterns in a negative way.	
Concept: Oceans & Climate	
Session 1 (1 day): Lesson Questions: What causes ocean currents? How do ocean currents affect climate? What human activities use ocean currents? **Activate Prior Knowledge** Pose the following questions to students: • Have you ever swam at the beach and seen items float out from shore. • Were they at the ocean or a lake? • Did the items make it back to shore? • What do you think would happen if something got washed way out to sea? • Would it float in the waves and come back to shore or would it travel elsewhere? **Stimulate Interest** To get students thinking about how objects move in the ocean, have them watch the video segment Plastic Trash, about a lost shipment of yellow rubber ducks. View the video segment. Tell students that they are going to read about two messages in bottles that made their way around the world. Ask if anyone has an idea of how long it might take to travel from one point to another. For example: ask how long it might take a bottle to travel from New York City to the west coast of England. Use a world map to illustrate your point and ask for volunteers to offer additional locations and answers. Have students read the Core Interactive Text. Discuss thoughts on these discoveries. Were they surprised? Excited? Do they think this kind of thing is a good idea? In the age of Internet and social media, have students discuss the pros and cons of such a method of communication. Introduce the vocabulary terms that relate to ocean currents (density, ocean currents, salinity). Ask students to turn and talk to a neighbor to describe their understanding of each term then use the Interactive Glossary to assess and modify their understanding.	video segment: Plastic Trash (3:57) Core Interactive Text: Getting to Know Ocean Currents Interactive Glossary

Session 2 (1 day): Lesson Question: What causes ocean currents? Have students cite evidence to answer the Lesson Questions as they read and add text to the Scientific Explanation. Call on volunteers to read the sections on What Causes Ocean Currents and Surface Currents under the Explore tab aloud or have students read it themselves. Discuss the directions the currents flow and how they travel around the entire globe. Use the figure in the text and if possible, project it on the board. You might choose to discuss the misconception that some people think the ocean currents are a perfect mirror of the global winds. Introduce density currents, and discuss with students the difference between the two types of ocean currents. Have students read the Density Currents section. Display the diagram of the ocean conveyor belt, and call on volunteers to explain the nature of the ocean currents at various points on the map. You might choose to discuss the misconception that some people think that ocean water is the same everywhere.	Core Interactive Texts: What Causes Ocean Currents and Surface Currents, Density Currents
Session 3 (1 day): Lesson Question: What causes ocean currents? Allow students to use the first 20 minutes or so of this session to view video segments and images that further explain ocean currents, how they form, and where they flow. Refer students to the Explain tab of this concept to view these videos. Call on volunteers to offer additional information to what the students have already learned. Review the misconceptions discussed in class, and ask if anyone has learned something in the video segments that helps clear up the misconceptions.	video segments: Ocean Currents (5:09), How Ice Caps Form and Move: Patterns of Ocean Currents (2:54), Ocean Currents (1:42)
Session 4 (Approx. 1 day): Lesson Question: What causes ocean currents? http://www.teachoceanscience.net/teaching_resources/education_modules/observing_the_ocean/explore_ocean_physics/ Density Current demonstration	World map handout "Temperatures Around the World" activity handout
Lesson Question: What causes ocean currents? **Session 5 (1 day):**	Student worksheets

Students collect evidence from the Explore sessions, the videos and the Hands-on Lab to complete the Scientific Explanation Student Sheet (sections "Claim" and "Explanation"). Have groups of 2-4 students share their explanation with each other and then revise or enhance their explanations based on group discussion. Bring the class together and have individual students summarize what they now know about what causes ocean currents. Use these summaries to develop a class consensus on the answers to the Lesson Question.	
Session 6 (1 day): Lesson Question: How do ocean currents affect climate? Cite evidence to answer the Lesson Questions as they read and add text to the Scientific Explanation. Direct students to read the information under the Explore tab. Call on a volunteer to state one fact they learned while reading. Write it on the board, and continue a discussion as to how this fact relates to climate and ocean currents. For example, a student might state that the sun's energy is not distributed evenly across Earth's surface. Continue on with how this affects the temperatures across Earth's surface, both on land and on water. Continue the discussion until the major points of the section are covered and students have an understanding of the relationship between ocean current and the distribution of Earth's climates. Review the diagram of the distribution of solar energy on Earth and the video segment that accompanies this section, Ocean Currents.	Core Interactive Text: How Do the Ocean's Currents Affect Climate?, video segment:Ocean Currents
Session 7-8 (Approx. 2 days): Lesson Question: How do ocean currents affect climate? Direct students to the Hands-On activity: Temperatures Around the World. Provide students with printouts of world map showing outlines of countries and list of coastal cities. Have students construct data tables before beginning. Have students predict and research high temperatures for cities. Ask students to predict the average temperatures of ocean currents based on their points of origin. Once completed, you might wish to have students plot their predictions and data on a large class map. Once every group has added their data, hold a class discussion to go over the answers. If students don't understand why a particular prediction did not happen as expected, refer them to the maps of ocean currents and video segments in the Explore tab.	"Temperatures Around the World" handout World map handout Paper and ruler for constructing tables

Session 9 (1 day): Lesson Questions: What causes ocean currents? How do ocean currents affect climate? What human activities use ocean currents? Assign students one of the three reading passages associated with this concept, and answer the questions that accompany each one. If time permits, call on volunteers to give a brief summary of what they have learned, or something they found particularly interesting in the passage. You might choose to show several of the video segments that are associated with the reading passages as well.	reading passages: Cruisin' the East Australian Current, Ocean Currents and Shipping Lanes, The Impact of Melting Ice; video segments: Bio-Remediation: Using Microbes to Clean-Up Oil Spills(1:29), Earth's Changing Climates (9:05), Melting Arctic Ice (6:14), Nanotechnology (5:53)
Session 10 (Approx. 1-2 days): Lesson Question: What causes ocean currents? How do ocean currents affect climate? What human activities use ocean currents? To help students apply their understanding of oceans and climate, you may wish to have them complete one or more of the following projects. Time to complete each project will vary and some may require work outside the classroom. Optional Project #1 Ocean Current Board Builder Optional Project #2 Write a 5-minute skit about sea voyages through time. Optional Project #3 Design and carry out a lab investigation to model the effects of continents on the paths of ocean currents. Present this as a demo to the class. Optional Project #4 Complete a current event or local news report about Cape May fisheries after reading the articles, "Fisherman's Wharf Tour Answers Some Fishy Questions" and "Fishing: More than just a hobby in Cape May" Optional Project #5 Complete the Brief Constructed Response (BCR) "Changes in Ocean Salinity and Factors That Affect Climate". As described in the Teacher's Guide, students view one of the videos listed before answering the BCR question.	Board Builder Tool video equipment Constructed Response (CR): Changes in Ocean Salinity and Factors that Affect Climate Teacher's Guide video: Earth Science for Students: Oceanography (24:04) video: The Endless Voyage: Deep Connection (27:22) Reading articles: "Fisherman's Wharf Tour Answers Some Fishy Questions" and "Fishing: More than just a hobby in Cape May"