



of the country. [Note: This SLO is based disciplinary core ideas found in the Framework. It is included as a scaffold to the following

**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.** [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution; emphasis on atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents.] [Assessment Boundary: Assessment does not include the dynamic processes.]  
**(MS-ESS2-6)**

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.
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.

### **Big Ideas - Students will understand that...**

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- 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. recycling is important and beneficial to our very existence
  - 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.
- 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.

## **Essential Questions - What provocative questions will foster inquiry and transfer of learning**

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*Is it possible to exert force on an object without touching it?*

*How does a Maglev train work?*

*If I were able to eliminate air resistance and dropped a feather and a hammer at the same time, which would land first?*

## **Content - Students will know...**

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- Fields exist between objects that exert forces on each other even though the objects are not in contact.
- The interactions of magnets, electrically charged strips of tape, and electrically charged pith balls are examples of fields that exist between objects exerting forces on each other, even though the objects are not in contact.
- Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object or a ball, respectively).
- Cause-and-effect relationships may be used to predict phenomena in natural or designed systems.
- Factors affect the strength of electric and magnetic forces.
- Devices that use electric and magnetic forces could include electromagnets, electric motors, and generators.
- Electric and magnetic (electromagnetic) forces can be attractive or repulsive.
- The size of an electric or magnetic (electromagnetic) force depends on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.
- Cause-and-effect relationships may be used to predict the factors that affect the strength of electrical and magnetic forces in natural or designed systems
- Gravitational interactions are always attractive and depend on the masses of interacting objects.
- There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass.
- Evidence supporting the claim that gravitational interactions are attractive and depend on the masses of

interacting objects could include data generated from simulations or digital tools and charts displaying mass, strength of interaction, distance from the sun, and orbital periods of objects within the solar system.

### **Skills - Students will be able to...**

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- Students will conduct an investigation and evaluate an experimental design to produce data that can serve as the basis for evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
- Students will identify the cause-and-effect relationships between fields that exist between objects and the behavior of the objects.
- Students will ask questions about data to determine the effect of the strength of electric and magnetic forces that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.
- Students will perform investigations using devices that use electromagnetic forces.
- Students will collect and analyze data that could include the effect of the number of turns of wire on the strength of an electromagnet or the effect of increasing the number or strength of magnets on the speed of an electric motor.

### **Stage 2: Assessment Evidence**

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#### **Assessment**

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Chapter 13 assessments including tests and quizzes

Chapter 14 assessments including tests and quizzes

MiniLabs

Inquiry Labs

Essential Question Responses

Hurricane Webquest

Lab activity worksheets

Building Clouds rubric

Create a Weather Map rubric

Design and create a weather instrument rubric

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.

## **Stage 3: Learning Plan**

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### **Learning Activities**

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Lab Focus:

Where does Air apply pressure?

Why does furniture get dusty?

How does acid rain affect plants?

How does Earth's axis affect climate?

How is climate affected by volcanic eruptions?

**Accommodations for students with IEPs and learning difficulties:**

- Model how to perform specific roles when conducting experiments
- visual sentence frames using academic vocabulary for discussion
- use science "Reading Essentials" packets in place of textbook sections
- print lesson vocabulary in premade flashcard fashion to be used as a study guide
- allow verbal responses in place of written responses
- provide graphic organizers for comparing and contrasting science concepts
- modify graphic organizers/worksheets to reduce choices
- Use visuals to show important vocabulary for students to make connections
- Vocabulary word banks and strategies
- Think alouds and Think-Pair-Share

**For ELL students:**

- visuals for vocabulary
- word wall
- additional word work such as illustrating vocabulary and playing vocabulary games
- partner reading
- choral reading
- color-coded sticky notes for close reading to identify which sticky notes pertain to vocabulary
- questions about text, etc.
- When students make an error in speaking, answer or restate what they said using the correct form without drawing attention to the mistake.

**For gifted students:**

- additional self-selected science resources to explore the global impact of pollution created by fossil fuels

-offer bonus points for "Reaching Higher" critical thinking questions

## **Resources**

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**McGraw Hill Earth Science Volume 2 Unit 3**

**Chapter 12**

**Chapter 13**

**Chapter 14**

**ConnectEd.Mcgraw-hill.com resources**

**NJDOE Model Curriculum**

**Quizlet.com**

**Padlet.com**

**ebackpack.com**

## **Unit Reflections & Teacher Notes**

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Reflection: Because the information is layered and presented numerous times throughout the lesson, the students, without hesitation, can tell you that weather is caused by the uneven heating of the atmosphere. In addition, they mastered the fact that different surfaces, like water and land, help to create global weather patterns. The class is aware that burning fossil fuels causes an increase in global temperatures and I believe that they can easily name several alternate energy sources and the benefits of them. A change that I will make next year should be that instead of having all students make weather vane, allow the students to choose one of the four major weather instruments (weather vane, anemometer, barometer and thermometer) to design and make using common household items. Next year be sure to start the "Effects of Acid Rain" activity early enough to allow time for the plants to grow.

Students were able to see the effects but could have observed more severe crop damage if time allowed.