



EXPEDITIONARY
LEARNING

Grade 5: Module 4: Unit 1: Lesson 3

Relationships Between Key Scientific Concepts: What Causes Hurricanes?



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Long-Term Targets Addressed (Based on NYSP12 ELA CCLS)

- I can explain what a text says using quotes from the text. (RI.5.1)
- I can explain important relationships between people, events, and ideas in a historical, scientific, or technical text using specific details in the text. (RI.5.3)
- I can determine the meaning of academic words or phrases in an informational text. (RI.5.4)
- I can determine the meaning of content words or phrases in an informational text. (RI.5.4)

Supporting Learning Targets

- I can explain the relationship between scientific concepts about hurricanes using specific details from the text.
- I can use context clues to determine the meaning of new words in an article about hurricanes.

Ongoing Assessment

- Annotated "How Does a Hurricane Form?"
- Hurricane Concepts note-catcher
- Glossaries (scientific and academic vocabulary)



Agenda	Teaching Notes
<p>1. Opening</p> <p>A. Checking Independent Reading Homework and Engaging the Reader: First Account of a Hurricane (8 minutes)</p> <p>B. Review Learning Targets (2 minutes)</p> <p>2. Work Time</p> <p>A. First Read: “How Does a Hurricane Form?” (10 minutes)</p> <p>B. Second Read with a Partner: Cause and Effect Relationships about Hurricanes (20 minutes)</p> <p>C. Vocabulary to Deepen Understanding: Charades (10 minutes)</p> <p>3. Closing and Assessment</p> <p>A. Debrief: What Have We Learned about Hurricanes? (5 minutes)</p> <p>B. Review Learning Targets (5 minutes)</p> <p>4. Homework</p> <p>A. Reread the “Hurricanes” article aloud to someone at home.</p> <p>B. Read your independent reading book.</p> <p>C. Add vocabulary words to your scientific and academic word glossaries.</p>	<ul style="list-style-type: none">• In this lesson, students will continue practicing standard RI.5.3. They explain the scientific concepts behind the causes of hurricanes, just as they did in the previous lesson on earthquakes, as well as the effects on the environment and humans that categorize hurricanes as a natural disaster. Students will not be expected to develop deep understanding of the science behind hurricanes during the literacy lessons of this unit. Teachers should address these important scientific concepts during science lessons.• Note that the first read of the text is aloud due to the fact that the text is above grade-level (Lexile 1140.) Reading the text aloud allows all students access to an initial understanding of the ideas presented, and provides an opportunity to model fluent reading.• As in Lesson 2, students are given a note-catcher to fill in. Consider stapling or taping the completed note-catcher into students’ journals to keep all their thinking about natural disasters in one place.• Please bear in mind that Youtube, social media video sites, and other website links may incorporate inappropriate content via comment banks and ads. While some lessons include these links as the most efficient means to view content in preparation for the lesson, be sure to preview links, and/or use a filter service, such as www.safeshare.tv, for actually viewing these links in the classroom.• In advance: Write and post the vocabulary words and definitions for this lesson for students to refer to during Work Time, Part C and in preparation for homework.• Review: Charades game and Fist-to-Five protocol (Appendix 1).



Lesson Vocabulary	Materials
<p>relationship, concepts, context; tropical cyclone, condenses, cumulonimbus, unstable, mound, inland</p>	<ul style="list-style-type: none">• Journals• Independent reading book• What Do We Know about Natural Disasters? anchor chart (begun in Lesson 1)• Science of Hurricanes video clip. Play only from 0:00 to 1:48.• http://www.history.com/videos/science-of-a-hurricane#science-of-a-hurricane• “How Does a Hurricane Form?” article (one per student)• Hurricane Concepts note-catcher (one per student and one to display)• Hurricane Concepts note-catcher (answers, for teacher reference)• Vocabulary Strategies anchor chart (used in Lesson 2)• Hurricanes anchor chart (from Lesson 1)• Evidence flags (five per student)



Opening	Meeting Students' Needs
<p>A. Checking Homework and Engaging the Reader: Firsthand Account of a Hurricane (8 minutes)</p> <ul style="list-style-type: none"> • Ask students to take out their journals and independent reading book with evidence flags from homework. Focus students on the What Do We Know about Natural Disasters? anchor chart (from previous lessons). • Ask students to read silently to themselves the things written on the anchor chart. Then invite them to turn to a partner: <ul style="list-style-type: none"> * “What is one piece of evidence from your independent reading book that you flagged for homework that could be added to the chart?” • Call on several students to share their evidence. Add them to the class anchor chart and invite students to do the same in their anchor charts in their journals as well as add any others they may have found evidence for during their reading. • Remind students that in the previous lesson, they read a text and learned about earthquakes as natural disasters. Tell them that they will now learn about hurricanes beginning by watching a video clip. Ask students to think about this question as they watch and listen: <ul style="list-style-type: none"> * “What happens during a hurricane?” • Play the Science of Hurricanes video clip. • Invite students to turn and talk with a partner about what they saw and heard happens during a hurricane. Have a few students share their discussions. 	<ul style="list-style-type: none"> • Some students may benefit from having a partner, or the teacher, read the lists from the anchor chart aloud. • Students who struggle with language would benefit from the teacher checking their evidence flags before class begins and letting them know they will be asked to share a particular one in front of the whole class, giving them time to prepare. • Consider playing the video clip more than one time for students to allow them more time for processing the information seen and heard.
<p>B. Review Learning Targets (2 minutes)</p> <ul style="list-style-type: none"> • Call on a student to read aloud the first learning target: <ul style="list-style-type: none"> * “I can explain the relationship between scientific concepts about hurricanes using specific details from text.” • Clarify for students that today’s lesson focuses on hurricanes, but they will be working on the same learning targets as yesterday when they read about earthquakes. Ask students to think about and share how they will meet the learning target, knowing that today’s work is similar to yesterday’s work. Listen for: “explaining how scientific concepts are connected during a hurricane,” “noticing how hurricanes happen, and where and why, just like we did for earthquakes,” “being able to tell how events are related,” etc. • Explain that in today’s lesson they will be learning about the scientific concepts behind a hurricane and how those concepts relate to one another. 	<ul style="list-style-type: none"> • Provide a nonlinguistic visual for the words <i>relationship</i> (two interlocking rings) and <i>concepts</i> (a light bulb).



Work Time	Meeting Students' Needs
<p>A. First Read: What Is a Hurricane? (10 minutes)</p> <ul style="list-style-type: none"> • Distribute the article “How Does a Hurricane Form?.” Tell students that they will follow a similar routine as in the last lesson. Remind them of the process they have used when reading text for the first time. • Tell students the first read will be aloud. • Start by reading the first five paragraphs of the article and ask students to annotate in the margin by writing the gist of what these paragraphs are about. • After about 3 minutes, ask students to share with their partner the gist they wrote. Invite a few partners to share aloud. Listen for: <ul style="list-style-type: none"> – “Hurricanes are violent storms; – Hurricanes are called tropical cyclones; – A hurricane needs certain ‘ingredients’ to form; – It’s about what makes a hurricane start to form; – There are four stages in the development of a hurricane, tropical storm,” or similar ideas. • Ask the class to listen to you read aloud the rest of the article, and tell them to write the gist in the margin when you pause after each paragraph. • Then invite a student to share aloud the gist he or she wrote in the margin. Listen for: <ul style="list-style-type: none"> – “Tropical Disturbance” paragraph 6 —“cloud columns become higher and larger; wind circulates” – “Tropical Depression” paragraph 7 —“more thunderstorms are created; winds spin faster” – “Tropical Storm” paragraph 8 —“winds blow faster and begin twisting around the eye, center of the storm” – “Tropical Cyclone” paragraph 9 —“winds reach 74 miles per hour and it becomes a tropical cyclone, a hurricane; pushes toward land” – Paragraph 10 —“cyclones weaken when they hit land but cause a lot of damage” 	<ul style="list-style-type: none"> • Provide the “Hurricanes” text in students’ L1 language when possible. • Students who struggle reading complex text may need to have the article further chunked into single sentences rather than paragraphs. • Consider displaying the article on a document camera and modeling writing the gist in the margin after each paragraph is read and students share their thinking about the gist. • Some students may need the paragraphs read aloud more than one time.



Work Time (continued)	Meeting Students' Needs
<p>B. Second Read with a Partner: Cause and Effect Relationships about Hurricanes (20 minutes)</p> <ul style="list-style-type: none"> • Ask students to think again about what good readers do when they read closely: <ul style="list-style-type: none"> * “What do readers do after reading for the gist?” • Call on a few students to share aloud. Listen for: “read again,” “read for a specific purpose,” etc. • Tell students that as they did with the other article in the last lesson, they will read this article a second time, this time paying close attention to the cause and effect relationships between scientific ideas that explain what causes and what happens during and after a hurricane. • Distribute and display the Hurricane Concepts note-catcher. Explain that in the left-hand column they will write what happens before a hurricane, in the middle columns they will write what happens during a hurricane, and in the right-hand column they will write what happens after a hurricane. Remind students that in texts, causes and effects are not always in order of how they happen (<i>chronological</i>). They will have to read carefully and think about what happens to cause a hurricane. Answer any chronological clarifying questions about the note-catcher. • Ask students to follow along as you reread the third and fourth paragraphs of the article aloud. Ask students to pay attention to what the text says about the two ‘ingredients’ required for a tropical cyclone, or hurricane, to form. Read aloud starting, “Tropical cyclones are like...” and end “These clouds are just the beginning.” • Ask: <ul style="list-style-type: none"> * “What happens before a hurricane begins to form?” • Listen for: “Wind passes over warm water, the water evaporates and cools, then condenses into water droplets. Cumulonimbus clouds form,” or similar suggestions. Model writing a synthesis of students’ ideas in the first column of the note-catcher and invite students to record this in their own note-catchers. • Ask students to continue reading the rest of the article with their partner and to record in the note catcher what the text says about what causes a hurricane to develop and what happens after a hurricane. Remind them that they should stop after each paragraph to write relationships between concepts about hurricanes in their note-catchers. • Circulate among partners redirecting or supporting students when necessary. • After 10-12 minutes, call on students to share what they wrote in their note-catchers (see Hurricane Concepts note-catcher, answers, for teacher reference) for ideas students might share. 	<ul style="list-style-type: none"> • Consider posting all questions asked during the lesson on chart paper or the white board for students to refer to throughout the lesson. • Students that struggle with writing would benefit from a partially filled-in note-catcher. • Consider pre-highlighting details to focus on in the text for students who struggle reading complex text in order to help them fill out the note-catcher.



Work Time (continued)	Meeting Students' Needs
<p>C. Vocabulary Work to Deepen Understanding: Charades (10 minutes)</p> <ul style="list-style-type: none">• Read aloud the second leaning target, “I can use context clues to determine the meaning of new words in an article about hurricanes.”• Draw students’ attention to the Vocabulary Strategies anchor chart. Ask:<ul style="list-style-type: none">* “Which strategy has been most helpful to you and why?”• Invite students to share with their partner another strategy on the anchor chart that they haven’t tried and will commit to using today.• Post and focus students on the list of vocabulary for this lesson. Assign each student a partner and two or three words from the list, ensuring that all words are assigned. As in the previous lesson, ask students to work with their partner to find each assigned word in the text and underline or circle it. Then, using strategies listed on the anchor chart, they are to determine the meaning of each word in context. Remind students to write the word, what it means, and a visual in the appropriate Glossary section of their journal.• Allow partners 4 or 5 minutes to determine the meaning of their words. Circulate to offer support and redirect as needed.• Refocus students whole group. Remind students of the game Charades that they have played in previous lessons in order to practice new vocabulary words.• Call on a volunteer for each word on the list to stand and silently act out their word. Ask students watching to call out the meaning of the word that they think the student is acting out. Write the meaning next to the posted words. Do as many words as there is time for.• Academic Words:<ul style="list-style-type: none">– <i>unstable</i>: can change quickly; volatile– <i>mound</i>: large amount of something piled up together– <i>inland</i>: away from the coast	<ul style="list-style-type: none">• Consider pre-highlighting vocabulary for students who may have difficulty finding it in the text.• Consider assigning students who struggle with language words whose meanings are more easily found in context.• Students who struggle with multiple tasks at the same time may not be able to circulate during the Charades protocol and write a word and its meaning. Consider allowing their partner to write for them or give them extra time later in the day to go back to the vocabulary and write it in their glossaries.



Work Time (continued)	Meeting Students' Needs
<ul style="list-style-type: none">• Scientific Words:<ul style="list-style-type: none">– <i>tropical cyclone</i>: the scientific term for a hurricane– <i>cumulonimbus</i>: a large cloud– <i>condenses</i>: changes from vapor (gas) to liquid• Have students return to their Hurricane Concepts note-catchers and revise any details that they may have a new understanding of now that they have reviewed vocabulary.• If there is time, remind students to add these words to their glossaries, or they may do so for homework.• Collect students' annotated "Hurricanes" articles and Hurricanes Concepts note-catchers to review as formative assessment. Focus on how well students are grasping cause and effect relationships while reading scientific text.	



Closing and Assessment	Meeting Students' Needs
<p>A. Debrief: What Have We Learned about Hurricanes? (5 minutes)</p> <ul style="list-style-type: none"> • Ask students to think about and share with a partner: <ul style="list-style-type: none"> * “What did you learn about hurricanes today?” * “What questions do you now have about hurricanes?” • Call on a few partners to share their discussions with the whole class. Add their ideas and questions to the Hurricanes anchor chart. Prompt students to add these new ideas to their anchor chart in their journal. • Have the class silently skim the list to see if the new information added today answers any of the questions listed on the chart. If there are some questions answered, cross them off the anchor chart. Invite students to do the same on their own anchor chart. 	<ul style="list-style-type: none"> • Students who struggle with language would benefit from sentence stems such as: “I learned _____ about hurricanes today,” and “One question I have about hurricanes now is ...”
<p>B. Review Learning Targets (2 minutes)</p> <ul style="list-style-type: none"> • As in Lesson 2, review the learning targets using the Fist-to-Five protocol. Read each learning target aloud and pause after each one to ask students to show a fist if they are still struggling with the learning target, five fingers if they have mastered the learning target, or any number of fingers in between to indicate their level of understanding of the learning target. • Distribute five evidence flags to students for homework. 	



Homework	Meeting Students' Needs
<ul style="list-style-type: none"> • Reread the "How Does a Hurricane Form?" article aloud to someone at home. As you read, think about the causes and effects of a hurricane. • Read your independent reading book. Be sure to read for evidence that can be added to the What Do We Know about Natural Disasters? anchor chart. Mark the evidence in your book using the evidence flags. • Add vocabulary words to your scientific and academic word glossaries. Don't forget the academic words from the learning targets (<i>relationship, concepts, context</i>). <p><i>Note: Review students' annotated "How Does a Hurricane Form?" articles and Hurricane Concepts note-catchers. Be prepared to return them to students by Lesson 4. Note any students who were not able to write the gist statements in the margins or list details about concepts appropriate for each column in the note-catcher. Plan to check in and review the reading with those students independently or in small groups.</i></p>	<ul style="list-style-type: none"> • Consider requiring students who struggle with independent reading to flag only five pieces of evidence to add to the class anchor chart. • Provide an audio recording of students' independent reading book for those students who struggle reading independently. • Allow students whose first language is something other than English the opportunity to read an independent book in their L1 language. • Prioritize the vocabulary words for those students who struggle with complex text (<i>relationship, concepts, context, continually, gradually</i>—all academic words).



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Supporting Materials



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“How Does a Hurricane Form?”

Hurricanes are the most awesome, violent storms on Earth. They form near the equator over warm ocean waters. Actually, the term hurricane is used only for the large storms that form over the Atlantic Ocean or eastern Pacific Ocean.

The generic, scientific term for these storms, wherever they occur, is tropical cyclone. Other names they are given, depending on where in the world they are born, are typhoons, cyclones, severe tropical cyclones, or severe cyclonic storms. Whatever they are called, the same forces and conditions are at work in forming these giant storms, which all can cause damage or devastation when they hit land where people live.

Tropical cyclones are like engines that require warm, moist air as fuel. So the first ingredient needed for a tropical cyclone is warm ocean water. That is why tropical cyclones form only in tropical regions where the ocean is at least 80 F for at least the top 50 meters (about 165 feet) below the surface.

The second ingredient for a tropical cyclone is wind. In the case of hurricanes that form in the Atlantic Ocean, the wind blowing westward across the Atlantic from Africa provides the necessary ingredient. As the wind passes over the oceans surface, water evaporates (turns into water vapor) and rises. As it rises, the water vapor cools, and condenses back into large water droplets, forming large cumulonimbus clouds. These clouds are just the beginning.

Meteorologists have divided the development of a tropical cyclone into four stages: Tropical disturbance, tropical depression, tropical storm, and full-fledged tropical cyclone.

1. **Tropical disturbance**

When the water vapor from the warm ocean condenses to form clouds, it releases its heat to the air. The warmed air rises and is pulled into the column of clouds. Evaporation and condensation continue, building the cloud columns higher and larger. A pattern develops, with the wind circulating around a center (like water going down a drain). As the moving column of air encounters more clouds, it becomes a cluster of thunderstorm clouds, called a tropical disturbance.



“How Does a Hurricane Form?”

2. Tropical depression

As the thunderstorm grows higher and larger, the air at the top of the cloud column is cooling and becoming unstable. As the heat energy is released from the cooling water vapor, the air at the top of the clouds becomes warmer, making the air pressure higher and causing winds to move outward away from the high pressure area. This movement and warming causes pressures at the surface to drop. Then air at the surface moves toward the lower pressure area, rises, and creates more thunderstorms. Winds in the storm cloud column spin faster and faster, whipping around in a circular motion. When the winds reach between 25 and 38 mph, the storm is called a tropical depression. Next is tropical storm.

3. Tropical storm

When the wind speeds reach 39 mph, the tropical depression becomes a tropical storm. This is also when the storm gets a name. The winds blow faster and begin twisting and turning around the eye, or calm center, of the storm. Wind direction is counterclockwise (west to east) in the northern hemisphere and clockwise (east to west) in the southern hemisphere. This phenomenon is known as the Coriolis effect.

4. Tropical cyclone

When the wind speeds reach 74 mph, the storm is officially a tropical cyclone. The storm is at least 50,000 feet high and around 125 miles across. The eye is around 5 to 30 miles wide. The trade winds (which blow from east to west) push the tropical cyclone toward the west that is, toward the Caribbean, the Gulf of Mexico, or the southeastern coast of the U.S. The winds and the low air pressure also cause a huge mound of ocean water to pile up near the eye of the tropical cyclone, which can cause monster storm surges when all this water reaches land.

Tropical cyclones usually weaken when they hit land, because they are no longer being fed by the energy from the warm ocean waters. However, they often move far inland, dumping many inches of rain and causing lots of wind damage before they die out completely.

Next, what are the five categories tropical cyclones.

<http://scijinks.nasa.gov/hurricane>



Hurricane Concepts
Note-Catcher

Hurricane Concepts:					
What happens before a hurricane?	What causes a hurricane?	What happens during a hurricane Chain of Events			What happens after a hurricane?
	Event/cause	Effect (what happen next) This, then, causes...	Effect (what happens next) This, then, causes...	Effect (What happen last)	



Hurricane Concepts Note-Catcher
Answers, For Teacher Reference

Hurricane Concepts:					
What happens before a hurricane?	What causes a hurricane?	What happens during a hurricane Chain of Events			What happens after a hurricane?
	Event/cause	Effect (what happens next) This, then, causes...	Effect (what happens next) This, then, causes...	Effect (what happens last)	
<p>Wind passes over warm water, the water evaporates and cools, then condenses into water droplets.</p> <p>Cumulonimbus clouds form.</p>	<p>Heat is released into the air, the warm air rises and is pulled into a column of clouds.</p>	<p>The thunderstorm grows and the air at the top cools and becomes unstable.</p> <p>The air at the top gets warmer and causes winds to move outward and begin spinning faster.</p>	<p>When winds reach 39 mph it becomes a tropical storm.</p> <p>The winds start blowing faster around the eye of the storm.</p>	<p>When winds reach 74 mph it becomes a tropical cyclone (hurricane.)</p> <p>The winds push the cyclone toward land and cause a mound of water to pile up, which causes surges.</p>	<p>When cyclones reach land they weaken, but they go inland causing lots of rain and wind damage.</p>