

Lesson 5: Answer Key 1

Scoring Guidance for Case Site Explanations

Allow your students to choose the modality for communicating their thinking. They can explain the phenomenon through written explanation or using a diagrammatic explanatory model or infographic. Guidance is provided depending on the modality students choose to use.

This assessment can be used to assess student progress on the LLPE. This LLPE is an integration of elements from the three dimensions.

5.A Construct a scientific explanation based on valid and reliable evidence that changes in temperature can have impacts on the water sources available for communities.		
SEPs	DCIs	CCCs
<p>6.3 Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. Students started to engage with this element in Lesson 2 when they analyzed and interpreted data from several reliable sources (e.g., NOAA and affiliated agencies). They added data from their own experiment in Lesson 3 and obtained additional information from informational texts in Lesson 4.</p> <p>This explanation task challenges students to synthesize evidence from across these sources and integrate that information with natural laws around how water cycles on Earth to explain why water sources are changing in one community.</p> <p>Look for how students apply science ideas to support their explanations. There should be clear references to different data sets and sources of evidence. Are there patterns in science ideas present or missing from all students' explanations? Students may also bring evidence from the classroom or their experiences to bolster their explanations.</p>	<p>ESS2.D 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.</p> <p>Students should use their prior understanding of how water cycles on Earth, especially the role of energy (i.e., temperature) in this process, to explain what water sources are changing in these communities. This is a fundamental idea behind climate change. Students need to establish the normal cycle of water on Earth and then explain which parts of that system are showing changes.</p>	<p>7.2 Small changes in one part of a system might cause large changes in another part.</p> <p>Stability and change is the focal CCC for this assessment as students bring together ideas about what would be "normal" (i.e., stable) for a community and what is changing in the community. Importantly, the data shows that small changes in temperature can lead to big impacts on communities. Students might communicate this idea by citing evidence from the data sets, investigations, or readings.</p>

The scoring guidance provided below uses a + and ++ notation that can help you identify different ideas that students should (or could) include in their responses.

- If several of the ideas marked with a + are missing from a student's response, this may indicate the student has not mastered the science ideas or that the student may be struggling to bring those ideas together in a written explanation or model. Additional probing of their thinking can provide insight about whether the student is struggling with a science practice or science idea or both.
- If all or almost all of the ideas marked with a + are present in a student's response, this may indicate the student has mastered the science ideas and is able to use them in a written explanation or explanatory model.
- If the ideas marked with a ++ are present in a student's response, this indicates that the student is bringing a deeper understanding of the science ideas or a deeper engagement with the practice to their response. Students should not be marked off if ideas marked with a ++ are not present in their response.

If students choose a diagrammatic explanatory model, infographic, or written response, look for these ideas represented in their response:

- + a statement or idea about normal precipitation for a place with evidence of the type of precipitation and how much would be expected.
- + a statement or idea about what is different about precipitation in a place with evidence to show greater or lesser precipitation, change in type, timing, or intensity of precipitation.
- + a statement or idea about normal temperature ranges and any change in the pattern of temperature in a place.
- + a statement or idea that explains how increasing temperatures increase evaporation rates, and, therefore, change the water vapor and/or precipitation available for a place.
- + ideas or statements that explain where typical water sources are for a community and how those sources are changing.
- ++ ideas about how temperature and/or precipitation remained stable (within a certain range) until recent years.
- ++ ideas about how small changes in one variable can have big changes in another variable.
- ++ ideas about how the timing or type of precipitation is changing as a result of changing temperature patterns.

Below is an example of how two case sites might look as they go from an initial explanation, peer reviewed, and then revised. These are only examples. Your students will express their ideas in different ways and in different formats. Students should provide at least two pieces of feedback on a peer's work.

Example initial explanation	Example peer feedback	Example revised explanation
<p>Headline: Water Shortages in East Porterville are the result of more dry years.</p> <p>Paragraph: The community of East Porterville is experiencing rising temperatures and more dry years than what they normally expect. Since the community relies on pumping groundwater, especially during dry years, the community is now experiencing water shortages in homes that do not have deep enough wells. Not all years are dry in East Porterville though. But even when they get more rain, it isn't enough to refill the aquifer.</p>	<p>Headline: Water Shortages in Porterville are the result of more dry years. <i>What about groundwater?</i></p> <p>The community of East Porterville is experiencing rising temperatures and more dry years than what they normally expect. <i>Can you add science ideas about evaporation and water vapor? Can you include evidence from drought data?</i></p> <p>Since the community relies on pumping groundwater, especially during dry years, the community is now experiencing water shortages in homes that do not have <u>deep enough wells</u>. <i>Why do they pump more water in dry years?</i></p> <p>Not all years are dry in East Porterville though. But even when they get more rain, it isn't enough to refill the aquifer. <i>Can you give evidence for this statement?</i></p>	<p>Headline: Water Shortages in East Porterville are the result of more dry years and less groundwater.</p> <p>Paragraph: The community of East Porterville is experiencing rising temperatures and more dry years than what they normally expect. The PDSI graph shows that Porterville had several very dry years recently. There is also less water vapor in the air, so there isn't a source of water for it to rain much either. Even though there is evaporation, the wind takes the water vapor to another place. Since the community relies on pumping groundwater, especially during dry years when they do not get as much rain, the community is now experiencing water shortages in homes that do not have deep enough wells. Not all years are dry in East Porterville though. But even when they get more rain, it isn't enough to refill the aquifer. The groundwater graph showed that the levels of the aquifer are declining, even during years with more rain.</p>

Example initial explanation	Example peer feedback	Example revised explanation
<p>Headline: More heavy rain and storm events are leading to more frequent floods in Vicksburg.</p> <p>Paragraph: Temperatures and precipitation are not normal for the area of Vicksburg. Vicksburg seems to be getting warmer and humid (high water vapor) air masses, which leads to more precipitation in the area. Because the town is settled along the Mississippi River, when it has heavy rain, it tends to flood. To make the situation worse, all the heavy rain from upstream flows downstream through Vicksburg, often making the flooding even worse. The data shows that the town has experienced more floods lately.</p>	<p>Headline: More heavy rain and storm events are leading to more frequent floods in Vicksburg. <i>What about temperature?</i></p> <p>Paragraph: Temperatures and precipitation are not normal for the area of Vicksburg. <i>Can you add evidence from the graphs?</i></p> <p>Vicksburg seems to be getting warmer and humid (<u>high water vapor</u>) air masses, which leads to more precipitation in the area. <i>Can you explain why?</i></p> <p>Because the town is settled along the Mississippi River, when it has heavy rain, it tends to flood. To make the situation worse, all the heavy rain from upstream flows downstream through Vicksburg, often making the flooding even worse. <i>Where did you see this?</i></p> <p><u>The data shows that the town has experienced more floods lately.</u> <i>Can you add specific times or amounts to this?</i></p>	<p>Headline: More heavy rain and storm events are leading to more frequent floods in Vicksburg.</p> <p>Paragraph: Temperatures and precipitation are not normal for the area of Vicksburg. Vicksburg seems to be getting warmer and humid (high water vapor) air masses, which leads to more precipitation in the area. When temperatures are warmer and there is a source of water, evaporation rates increase, causing more water vapor in the air. A NASA simulation showed that a lot of this water vapor comes from warmer oceans on the east side of the United States. This water vapor can fall as rain. The more there is in the air, the more rain that will fall. The video showed that the town's located right next to the Mississippi River, which means when the river floods, the town might flood, too. To make the situation worse, all the heavy rain from upstream flows downstream through Vicksburg, often making the flooding even worse. The data shows that the town has experienced more frequent floods in the last couple of decades.</p>