

Lesson 5: Answer Key 2

Alaska Wildfires and Sea Ice Key

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

5.C Compare graphs and charts from multiple claims to identify patterns in the similarities and differences to determine that changes in the environments are caused by increasing temperatures.		
SEPs	DCIs	CCCs
<p>4.4 Analyze and interpret data to provide evidence for phenomena.</p> <p>Students begin to build this skill in Lesson 2 as they analyze graphs presented for 6 different case sites. These graphs are compared for trends that might help explain why some locations experience changes in precipitation. In Lesson 3, students consider the influence of precipitation patterns that might cause a change in precipitation patterns that affect different locations. In Lesson 4, students gain more information from data over sea ice that can be interpreted as being influenced by increasing temperatures. In this lesson, students are presented with additional information and data in regards to wildfires and sea ice loss.</p> <p>By using skills from Lesson 2 in analyzing data and interpretation skills from Lessons 3-4 in addition to the ice data in Lesson 4, students are able to synthesize this new information to provide evidence that sea ice is decreasing and wildfires are increasing due to the increasing temperatures. Further, students are able to make a connection, as in Lesson 2, that the precipitation patterns, which are influenced by increasing temperatures, are exacerbating the environmental changes seen in the claims.</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 the increase in temperatures on ice, ocean temperatures, and atmospheric water vapor patterns to help explain why sea ice and wildfires could be occurring more frequently. The understanding of the increase of temperatures to these atmospheric patterns to cause increased droughts is also utilized as students explain the drought conditions in Alaska that contribute to an increase in wildfires.</p>	<p>1.4 Graphs, charts, and images can be used to identify patterns in data.</p> <p>The use of patterns presents itself continually in this assessment. As students analyze graphs and data from the wildfire reading, students look for patterns in trend data, and if differences exist in the data, students consider the potential cause-and-effect implications of the graphical datasets. The pattern of increased temperature across Alaska is seen to cause the increase in wildfires and decrease in sea ice, along with less-than-average precipitation and drier conditions in the area. Patterns in declining precipitation are seen to influence the patterns of increased wildfires and increased drought conditions. Students will communicate these ideas by explaining these connections in part 1 of the assessment and applying these ideas to explain how decreasing sea ice and increasing wildfires are connected to increasing temperatures in part 2 of the assessment.</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 that 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 that 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.

Part 1: Explaining the Headlines and Elder Stories

Last class period we investigated claims from headlines and elders. Look back at your observation table from yesterday. Are these claims from the headline and the elders, or do they have different causes? Are these headlines and stories also related to our other case sites? Answer the questions below to help determine if these changes are related, and what their potential cause could be.

Alaskan Headline Claims	Alaskan Elder Claims
Alaska is experiencing bad wildfires. It is dry and hot in the arctic.	Older, multi-year ice is disappearing. There is less sea ice than before. There is more water where the sea ice should be. Temperatures are increasing.

Communicate Claims and Evidence	Your Explanation:
<p>What do you think is happening to cause the headline claims below:</p> <ul style="list-style-type: none"> Alaska is experiencing bad wildfires. It is dry and hot in the arctic. <p>How does the data from last class period support your ideas?</p>	<p><i>Student responses should include:</i></p> <ul style="list-style-type: none"> + Bigger and more frequent wildfires and the drought in Alaska are related to an increase in temperature and a decrease in precipitation. <p><i>Data to support the claim:</i></p> <ul style="list-style-type: none"> + The precipitation data graphs shows precipitation is decreasing, which could be helping to dry out Alaska. + The temperature graphs show that the temperatures are increasing, making it warmer than before in Alaska. + The wildfires graph shows that the frequency and size of the wildfires is increasing. + The paragraph about wildfires says that they are more frequent. + The drought map shows that Alaska had lower-than-average rainfall during the time the headline was written. + As the temperature graphs increase, the precipitation graph decreases. + As the temperature graphs increase, the wildfire frequency and size also increase. + In 2019, when temperature is higher than the average, Alaska received less precipitation than normal. ++ The paragraph about wildfires says that the majority of wildfires are caused by lightning, and the precipitation could be changing to more thunderstorms than snowstorms, creating more lightning to start the wildfires.

<p>What do you think is happening to cause the elder claims below?</p> <ul style="list-style-type: none"> • Older, multi-year ice is disappearing. • There is less sea ice than before. • There is more water where the sea ice should be. <p>How does the data from last class period support your ideas?</p>	<p><i>Student responses should include:</i></p> <ul style="list-style-type: none"> + The sea ice is decreasing in age and in amount over time because the temperatures in Alaska are increasing, and if ice melts all the way, it cannot stay year after year. <p><i>Data to support the claim:</i></p> <ul style="list-style-type: none"> + The temperatures are increasing in Alaska, which could be melting the ice. + The sea ice graph shows that the amount of sea ice is going down. + Sea ice is decreasing in age. + As the temperatures increase on the temperature graph, the sea ice and sea ice age graphs decrease. ++ Most of the sea ice is now 0-1 years old, but about 30 years ago, most of the sea ice was over a year old.
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Part 2: Explaining the Connection Between the Wildfires and Sea Ice

The increasing wildfires and decreasing sea ice claims can appear to be very different phenomena. How might the loss in sea ice phenomenon be related to the wildfire phenomenon? Write a clear and convincing explanation to others to (1) explain how or why the disappearing sea ice is related to an increase in wildfires and (2) support how these are related with evidence.

Student responses should include:

+ The loss of sea ice and increase in wildfires are both related to each other by rising temperatures.

Student explanations on how the phenomena are related should include:

- How or why this is connected:

+ Sea ice melts more with increasing temperatures.

+ The increasing temperatures make it to where there is less old sea ice every year, which decreases the amount of sea ice each year.

++ Note: Do not mark students down if they connect sea ice to lack of precipitation. While sea ice is formed by freezing in the upper layers of the ocean, this process was not investigated by students; therefore, it's possible that students will think sea ice forms due to precipitation. Focus your analysis on the connection students articulate between sea ice and temperature.

- Wildfire connection to increasing temperatures:

+ Wildfires are occurring more frequently due to the land getting drier.

+ The drier land is a result of decreased precipitation.

+ The precipitation patterns are changing because of the increase in temperature.

+ The increase in temperature is also causing evaporation to happen at a higher rate, making the dry areas drier.

+ Because each of these events are related to each other by increasing temperatures, we can say that they are related or connected phenomena.

Student sources of evidence could include:

+ The temperature graph for Alaska is trending upwards.

+ The precipitation graph is trending downwards.

+ The map of Alaska shows that, during the reported wildfires, the state had lower than normal precipitation.

- + The sea ice amount graph shows a decreasing trend in the amount of sea ice each year.
- + The sea ice age graph shows a decreasing trend in the age of sea ice from year to year.

Do you think these changes will continue to occur in the future? Use data from the graphs to support your answer.

Note that this question is meant to aid in navigation to the second lesson set. This question does not have to be formally assessed and is meant to get students thinking about whether the warming trends are going to continue, and what might be causing the increase in temperatures.

Student responses should include:

- + These changes could continue to occur in the future.

Students may use any of the data below to support their answer:

- + Temperatures are increasing and look like they will continue to increase in the future.
- + The sea ice is decreasing as temperatures rise. If temperatures continue to rise, more sea ice will melt.
- + The wildfires are increasing as temperatures rise. If temperatures continue to rise, more wildfires may happen.
- + The droughts are increasing as temperatures rise. If temperatures continue to rise droughts could get worse.
- + The precipitation for all locations is changing as temperatures rise. If the temperatures continue to rise, precipitation could keep changing.
- + If temperatures continue to rise, then the changes will continue to occur in the future.
- ++ Any connections between the 6 case sites studied in Lessons 1-5 and the Alaskan case site data trends.