

Weather and Climate Coherence Flowchart

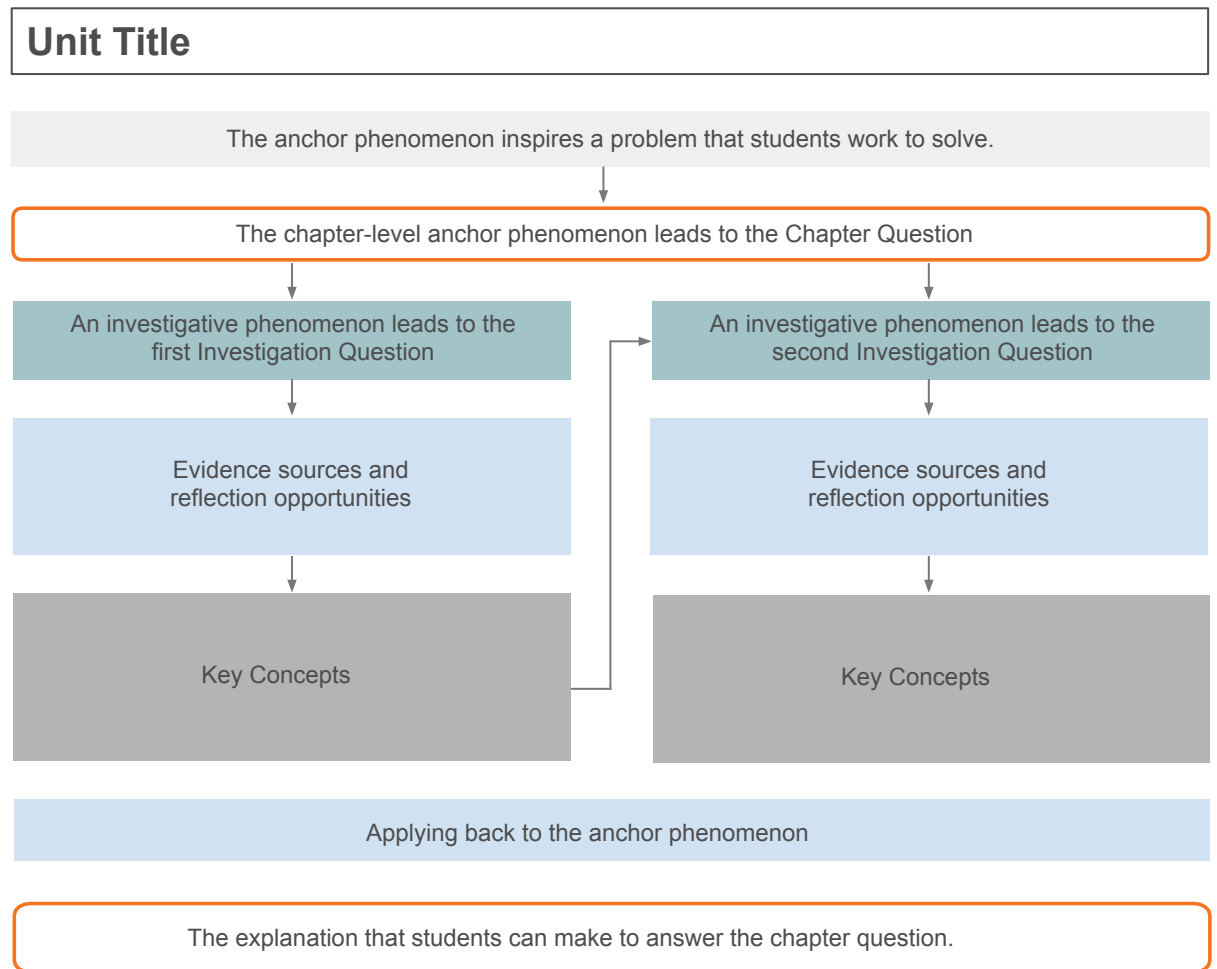
The storyline of the unit

In each Amplify Science unit, students figure out a phenomenon by asking questions, gathering evidence, and coming up with an explanation of how the phenomenon works. The Coherence Flowchart visually represents the storyline of the unit, showing the coherent flow of questions based on phenomena, evidence, and ideas that support students as they build complex explanations of the unit's anchor phenomenon. The Coherence Flowchart on the following pages (one chapter per page) can be used to see the connections between the phenomena and questions that drive students' experiences, the evidence they gather, the ideas they figure out, and the new questions that those ideas generate. The diagram to the right explains the structure of a chapter in the Coherence Flowchart.

In some units a design problem drives the investigations of the unit or of specific lessons. In these cases the design problem will be noted in place of the phenomenon.

Note: The Coherence Flowchart is a tool for teachers and is not meant to be distributed to students.

Typical structure of one chapter in a Coherence Flowchart



Instruction is framed by questions about the unit's anchor phenomenon and the related problem students are solving. Chapter Questions then guide students in figuring out the phenomenon, piece by piece. Within each chapter, investigative phenomena lead to Investigation Questions that focus students on a manageable piece of content that will help them figure out the Chapter Question. Each phenomenon leads to a question which motivates activities, and each activity provides specific evidence related to the Investigation Question. Students synthesize the understanding constructed over multiple activities, and this understanding is formalized through key concepts. Often a key concept leads students to an additional investigative phenomenon and Investigation Question students need to pursue to answer the Chapter Question. At the end of the chapter, students' new understanding is applied back to the unit's anchor phenomenon and leads students to a new Chapter Question or a final explanation.

Weather and Climate: Establishing an Orangutan Reserve

Unit Anchor Phenomenon

Problem students work to solve

Chapter-level Anchor Phenomenon

Chapter 1 Question

Investigative Phenomena

Investigation Questions

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to the problem

Explanation that students can make to answer the Chapter 1 Question

Orangutans live in places with very hot, very rainy climates.
Which island would be the best location for an orangutan reserve?

Arc, Blue, and Creek Islands have different weather.
Which island's weather would be best for orangutans?

Weather in a place changes day to day.
How can meteorologists describe weather in a way that helps them make comparisons? (1.2-1.5)

- Observe different weather conditions in a video (1.1)
- Brainstorm weather-related words and sort them into categories (1.1)
- Explore ways to measure rainfall and compare data from different measurement methods (1.2)
- Measure temperatures with sense of touch and thermometers (1.3)
- Visualize different temperatures (1.3)
- Explore weather in *World Weather Handbook* (1.3)
- Read *Sky Notebook* (1.4)
- Collect and record local weather data (1.4)
- Visualize rainfall data (1.5)

- Meteorologists make weather measurements in the same way each time so they can make comparisons. (1.4)

- Evaluate and sort evidence from the islands(1.5)
- Participate in Evidence Circles to discuss which island's weather is best for orangutans (1.6)
- Write an argument as a class to answer the Chapter 1 Question (1.6)

The reserve should be built on Blue Island because it had the hottest temperature and the most rain on the day that data was measured.

Weather and Climate: Establishing an Orangutan Reserve

Unit Anchor Phenomenon

Problem students work to solve

Chapter-level Anchor Phenomenon

Chapter 2 Question

Investigative Phenomena

Investigation Questions

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to the problem

Explanation that students can make to answer the Chapter 2 Question

Orangutans live in places with very hot, very rainy climates.
Which island would be the best location for an orangutan reserve?

The weather on Arc, Blue, and Creek Islands changes month to month.
Which island's weather will continue to be best for orangutans?

Weather in a place changes day to day.
Is there a pattern to the weather that we can use to make predictions? (2.1-2.4)

- Receive and discuss a month of island weather data (2.1)
- Practice interpreting data by creating a line plot of orangutan heights (2.1)
- Practice comparing line plots by comparing separate line plots of male and female orangutan heights (2.1)
- Read *Seeing the World Through Numbers* (2.2)
- Discuss how to describe a month of precipitation data (2.2)
- Compare temperature ranges in primate habitats (2.3)
- Use a digital Science Practice Tool to organize temperature data, analyze for patterns, and make predictions (2.3)
- Analyze weather data from Bintulu and make predictions (2.3)
- Analyze a month of local temperature data to find the range (2.4)

- Temperature data for one month can be described as the range of daily high temperatures over the whole month. (2.2)
- Precipitation data for one month can be described as the total precipitation over the whole month. (2.2)
- Although the temperature in a place can change each day, there is a pattern that can be described by the range of temperatures. Different places have different temperature ranges. (2.3)
- Scientists evaluate evidence to find the strongest evidence. Stronger evidence makes an argument more convincing. (2.4)

- Evaluate and sort evidence from the islands (2.4)
- Participate in Evidence Circles to discuss which island's weather will continue to be best for orangutans (2.5)
- Write arguments to answer the Chapter 2 Question (2.5)

The reserve should be built on Creek Island because it had the highest temperature range and highest amount of total rainfall over the month of available data.

Weather and Climate: Establishing an Orangutan Reserve

Unit Anchor Phenomenon

Problem students work to solve

Chapter-level Anchor Phenomenon

Chapter 3 Question

Investigative Phenomena

Investigation Questions

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to the problem

Explanation that students can make to answer the Chapter 3 Question

Orangutans live in places with very hot, very rainy climates.
Which island would be the best location for an orangutan reserve?

The weather on Arc, Blue, and Creek Islands changes month to month.
Over many years, which island's weather will be best for orangutans?

Weather in a place changes month to month.
How can we predict what the weather in a place will be like many years from now? (3.1-3.6)

- Receive and discuss new island data, which includes a year of weather data (3.1)
- Create a bar graph representing data over time (3.1)
- Connect monthly temperature ranges to monthly averages on a bar graph (3.1)
- Analyze and compare bar graphs of average high temperatures in different locations (3.2)
- Observe graphs of average high temperatures in a location over many years to find yearly patterns (3.2)
- Use a digital tool to organize temperature data into bar graphs, find a pattern, and make predictions (3.2)
- Compare graphs of specific years of temperature data to graphs of average temperature data (3.3)
- Analyze a graph of average precipitation and make predictions based on yearly pattern (3.3)
- Analyze graphs in *World Weather Handbook* to identify warm, cold, wet, and dry seasons (3.3)
- Read *What's Going On with the Weather?* (3.4)
- Discuss bar graphs in *What's Going On with the Weather?* to connect seasons to climate (3.4)
- Use *World Weather Handbook* to compare climates of different locations (3.5)
- Graph local weather and compare local climate to climate of other locations (3.5)
- Use local weather graphs to visualize future weather at different times of year (3.6)

- Even though the weather can be different every day, there is a pattern to the weather. The seasons that happen in one year repeat at the same time every year. (3.3)
- Different places have different climates. (3.5)

- Evaluate and sort evidence from the islands (3.6)
- Participate in Evidence Circles to discuss which island's weather will be best for orangutans over many years (3.7)
- Write arguments to answer the Chapter 3 Question (3.7)

The reserve should be built on Arc Island because one year of data reveals that Arc Island has a consistent seasonal pattern: it is warm and rainy throughout the year, while Blue Island has a dry season and Creek Island has a cold season.

Weather and Climate: Establishing an Orangutan Reserve

Unit Design

Problem

Another problem students work to solve

Chapter-level Anchor Phenomenon

Chapter 4 Question

Investigative Phenomena

Investigation Questions

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to the problem

Explanation that students can make to answer the Chapter 4 Question

We want to protect the WPO offices from future weather-related natural hazards.
How can you protect buildings from damage by weather-related natural hazards?

A hurricane damaged the WPO offices.
How can the WPO prepare for natural hazards that might damage their offices?

Natural hazards sometimes occur.
How can people prepare for natural hazards? (4.1-4.4)

- Receive data about natural hazards affecting the Wildlife Protection Organization (4.1)
- Map past natural hazards using a digital Science Practice Tool to look for patterns and make predictions (4.1)
- Map temperatures to find a spatial pattern in temperature data (4.1)
- Visualize the difference between mild and severe weather (4.2)
- Read *Dangerous Weather Ahead!* (4.2)
- Use maps in *Dangerous Weather Ahead!* to predict possible local natural hazards (4.2)
- Plan, make, and test model structures that can withstand simulated hurricane conditions (4.3)

- There is a pattern to where different types of weather happen. (4.2)
- People can design solutions to prevent damage caused by natural hazards. (4.3)

- Participate in Evidence Circles to discuss how the WPO should protect its office building from future natural hazards (4.4)
- Write arguments about what changes the WPO should make to protect its office building from future natural hazards (4.4)

Weather-related natural hazards include blizzards, hurricanes, and lightning strikes. It's possible to implement a variety of protective measures for buildings that can minimize damage from these severe weather events. The Wildlife Protection Organization's office building in Florida has already been damaged by a hurricane. Since this area also has a history of lightning strikes, students recommend solutions that could prevent future damage.