Sunlight and Weather Coherence Flowchart

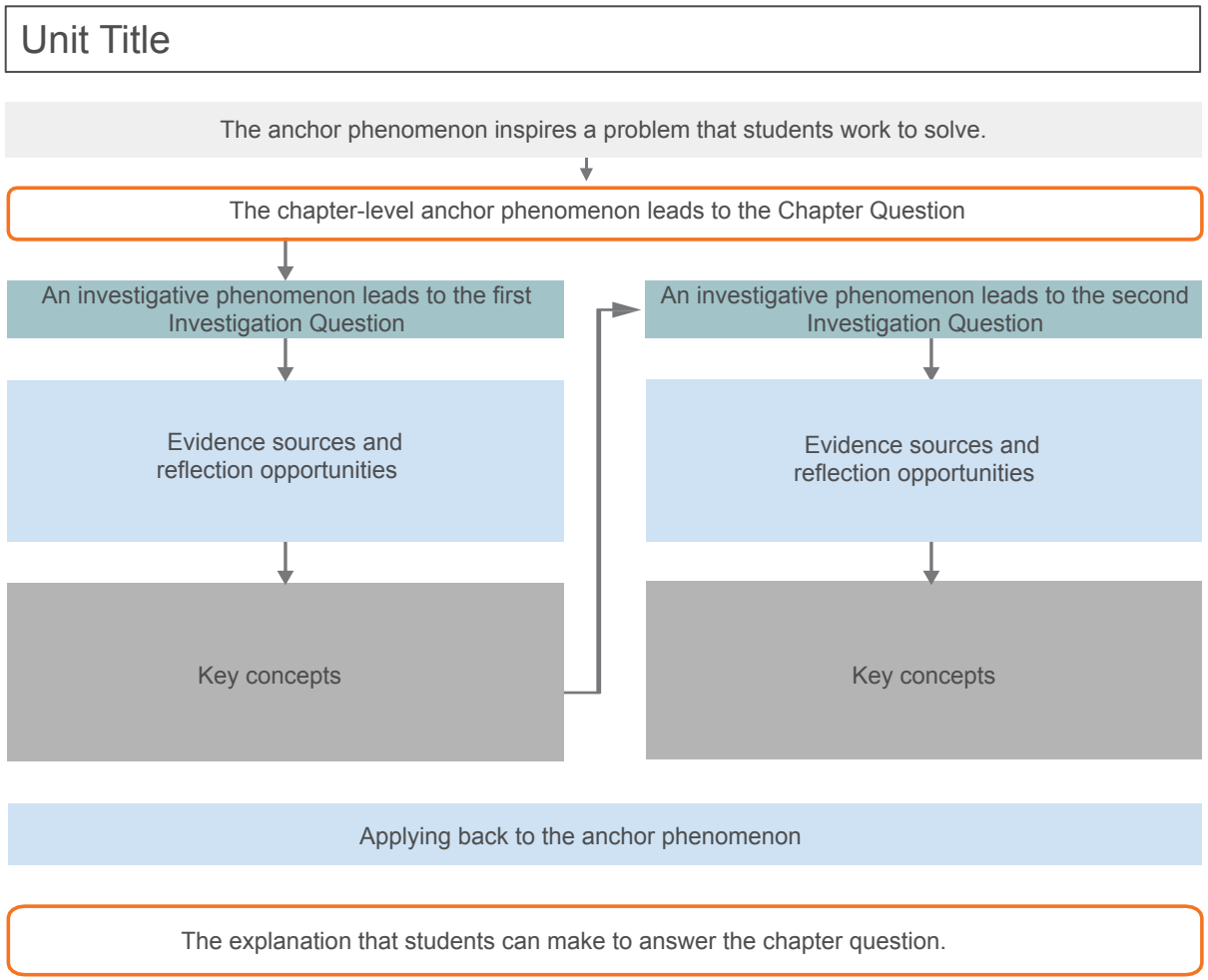
The storyline of the unit

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.

AmplifyScience

Sunlight and Weather: Solving Playground Problems

Unit Anchor Phenomenon

Problem students work to solve

Students at Carver Elementary School are too cold during morning recess, while students at Woodland Elementary School are too hot during afternoon recess.

Why are the playgrounds at two schools different temperatures?

Chapter-level Anchor Phenomenon
Chapter 1 Question

Different playgrounds have different weather on different days
What is the weather like on the playgrounds? (introduced in 1.4)

Investigative Phenomena
Investigation Questions

There are different types of weather and it can be a different temperature on different days.

How do we describe weather? (1.1-1.3)

Evidence sources and reflection opportunities

- Read the first half of What Is the Weather Like Today? (1.1)
- Participate in Think and Walk to label photographs with appropriate weather icons (1.1)
- Participate in Weather Types movement routine (1.1)
- Observe and describe local weather using weather words (1.2)
- Read the second half of What Is the Weather Like Today? (1.2)
- Measure temperature in cups of water (1.2)
- Observe, measure, and record local weather, including temperature (1.3)

Key concepts

- Weather can be sunny, cloudy, windy, rainy, or snowy. (1.1)
- Weather can be sunny, cloudy, windy, rainy, snowy, and different temperatures. (1.2)

Application of key concepts to problem

- Graph playground weather data from Woodland and Carver Elementary Schools (1.4)
- Shared Writing to answer the Chapter 1 Question (1.4)

Explanation that students can make to answer the Chapter 1 Question

The weather at Carver Elementary and Woodland Elementary is similar. Both schools have many sunny days and some cloudy, windy, or rainy days. The type of weather at each school must not be causing the difference in their playgrounds' temperatures.

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Unit Anchor Phenomenon

Problem students work to solve

Students at Carver Elementary School are too cold during morning recess, while students at Woodland Elementary School are too hot during afternoon recess.

Why are the playgrounds at two schools different temperatures?

Chapter-level Anchor Phenomenon
Chapter 2 Question

Sometimes playgrounds are warmer than other times.
Why do the playgrounds get warm?

Investigative Phenomena
Investigation Questions

Sometimes surfaces are warmer than other times.

Why does Earth's surface get warm? (2.1-2.3)

Evidence sources and reflection opportunities

- Develop and use the Warming Model to investigate the effect of sunlight on Earth's surface (2.1)
- Graph Warming Model results (2.2)
- Read about models and using models to investigate big things in Handbook of Models (2.2)
- Measure and record surface temperature on the school playground (2.2)
- Measure and compare surface temperatures in the sun and in the shade on the school playground (2.3)
- Play the kinesthetic Sunlight Game (2.3)
- Participate in Think and Walk to choose the relative temperature of surfaces in the sun and the shade in photographs (2.4)
- Use Explanation Language Frame to explain why one surface is warmer than another (2.4)

Key concepts

- When light shines on a surface, the surface gets warmer. (2.3)

Application of key concepts to problem

- Analyze and compare Carver and Woodland playground surface temperature data (2.4)
- Shared Writing to answer the Chapter 2 Question (2.4)

Explanation that students can make to answer the Chapter 2 Question

The surfaces of the playgrounds get warm because sunlight shines on their surfaces during the day.

Sunlight and Weather: Solving Playground Problems

Unit Anchor Phenomenon

Problem students work to solve

Students at Carver Elementary School are too cold during morning recess, while students at Woodland Elementary School are too hot during afternoon recess.

Why are the playgrounds at two schools different temperatures?

Chapter-level Anchor Phenomenon
Chapter 3 Question

Playgrounds are usually warmer in the afternoon.
Why are the playgrounds warmer in the afternoon?

Investigative Phenomena
Investigation Questions

Sometimes surfaces are warmer than other times even if light is shining on them both times.

Why is Earth's surface warmer in the afternoon? (3.1-3.2)

Evidence sources and reflection opportunities

- Read Getting Warm in the Sunlight
- Develop and use the Warming Over Time Model to investigate how surfaces warm over time (3.1)
- Graph and discuss Warming Over Time Model results (3.2)
- Analyze school playground surface temperature data (3.2)
- Read about models of fast and slow things in Handbook of Models (3.2)
- Play the kinesthetic Sunlight Game to model warming over time (3.3)
- Write and partner read the Playground in the Sunlight mini-book (3.3)
- Participate in Think and Walk to choose photographs of surfaces that have had sunlight shining on them for longer (3.4)
- Use Explanation Language Frame to explain why a surface gets warmer over time (3.4)

Key concepts

- The longer light shines on a surface, the warmer the surface gets. (3.3)

Application of key concepts to problem

- Analyze and compare Carver and Woodland playground surface temperature data (3.4)
- Shared Writing to answer the Chapter 3 Question (3.4)

Explanation that students can make to answer the Chapter 3 Question

The playgrounds at both schools are warmer in the afternoon than in the morning because sunlight has been shining on the surfaces for a longer time.

Sunlight and Weather: Solving Playground Problems

Unit Anchor Phenomenon

Problem students work to solve

Students at Carver Elementary School are too cold during morning recess, while students at Woodland Elementary School are too hot during afternoon recess.

Why are the playgrounds at two schools different temperatures?

Chapter-level Anchor Phenomenon
Chapter 4 Question

Woodland Elementary School's playground is warmer in the afternoon than Carver Elementary School's playground.
Why is Woodland Elementary School's playground always warmer during recess?

Investigative Phenomena
Investigation Questions

Different surfaces become different temperatures even with the same amount of light shining on the surfaces.

Why does one surface on Earth get warmer than another, when sunlight shines on them for the same amount of time? (4.1-4.3)

Evidence sources and reflection opportunities

- Revisit Getting Warm in the Sunlight to consider how the color of a surface affects how it warms (4.1)
- Develop and use the Colored Surfaces Model to investigate sunlight's effect on pale and dark surfaces (4.1)
- Graph and discuss Colored Surfaces Model results (4.2)
- Read about using models to investigate one thing at a time in Handbook of Models (4.2)
- Investigate pale and dark surfaces on the school playground (4.2)
- Participate in Think and Walk to choose the relative temperature of pale and dark surfaces (4.3)
- Use Explanation Language Frame to explain why one surface is warmer than another (4.3)
- Read Cool People in Hot Places (4.3)

Key concepts

- Dark surfaces get warmer than pale surfaces when light shines on them. (4.2)

Application of key concepts to problem

- Shared Writing to answer the Chapter 4 Question (4.3)
- Shared Writing to suggest changes to the playgrounds to make them more comfortable (4.3)

Explanation that students can make to answer the Chapter 4 Question

Woodland Elementary's playground has a darker surface than Carver Elementary's playground. Woodland's playground is warmer because dark surfaces get warmer than pale surfaces when the sun shines on them.

Sunlight and Weather: Solving Playground Problems

Unit Anchor Phenomenon

Problem students work to solve

Students at Carver Elementary School are too cold during morning recess, while students at Woodland Elementary School are too hot during afternoon recess.

Why are the playgrounds at two schools different temperatures?

Chapter-level Anchor Phenomenon
Chapter 5 Question

Both the Carver and Woodland playgrounds experienced severe rain, but only Woodland's playground floods.
Why does only Woodland Elementary School's playground flood?

Investigative Phenomena
Investigation Questions

Sometimes weather affects people and sometimes it doesn't. *When does weather affect people most? (5.1)*	Not everywhere that experiences severe rainstorms ends up flooding. *Why does severe rain flood some places but not others? (5.2-5.3)*	People can stay safe when there is severe weather. *How do we stay safe from severe weather? (5.4-5.5)*

Evidence sources and reflection opportunities

• Read Tornado! Predicting Severe Weather (5.1) • Participate in Think and Walk to choose the relative severity of weather events depicted in photographs (5.1)	• Identify possible causes of flooding at Woodland playground (5.2) • Develop and use Flooding Models to investigate why the playground floods (5.2) • Gather and analyze data from Flooding Models (5.3) • Read about using models to investigate the past and future in Handbook of Models (5.3)	• Read Tornado! Predicting Severe Weather (5.4) • Make and check predictions about flooding solutions (5.4) • Discuss how people prepare for severe weather (5.5) • Make and present weather preparation posters (5.5)

Key concepts

• Weather affects people most when it is severe. (5.1)		• Weather can be predicted. (5.4) • Predicting weather helps people prepare for it. (5.4)

Application of key concepts to problem

- Shared Writing to answer the Chapter 5 Question (5.3)
- Shared Writing to suggest Woodland playground changes to reduce flooding (5.4)

Explanation that students can make to answer the Chapter 5 Question

Woodland's playground floods after severe rain because it has a solid surface that does not absorb water, while Carver's playground has a gravel surface that rainwater can soak into.