Lesson 13

How Do I Explain Scientific Phenomena?

TEKS 5.5(A) Identify and use patterns to explain scientific phenomena or to design solutions.
TEKS 5.5(B) Identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems.

Introduction

Real-World Connection

Scientists use patterns and cause-and-effect relationships to explain things in the natural world. Analyzing these things helps them explain natural phenomena and solve problems. You will learn how they do this. Then, at the end of this lesson, you will come back to identifying natural patterns and cause-and-effect relationships.

Words to Know
identify
pattern
phenomenon
relationship
trend
cause and effect
sequence

What I May Already Know 4.5(A), 4.5(B)

- I know how to identify patterns in science.
- I can identify cause-and-effect relationships.

Understand the TEKS

It is important to know these terms when identifying patterns and cause-and-effect relationships.

To **identify** means to recognize, or to find something out.

A **pattern** is something that happens or appears in a regular and repeated way. It is something that is visible in nature.

A **phenomenon** is an observable fact or event, something that exists.

A **relationship** is an aspect that connects two or more things that work together.

A **trend** is a noticeable change in something over time.

In science, **cause and effect** explains why something happens. The cause is what makes the effect happen.

The **sequence** is the order of things, the particular order in which things are related.

Guided Instruction

Read the following information and answer the questions.

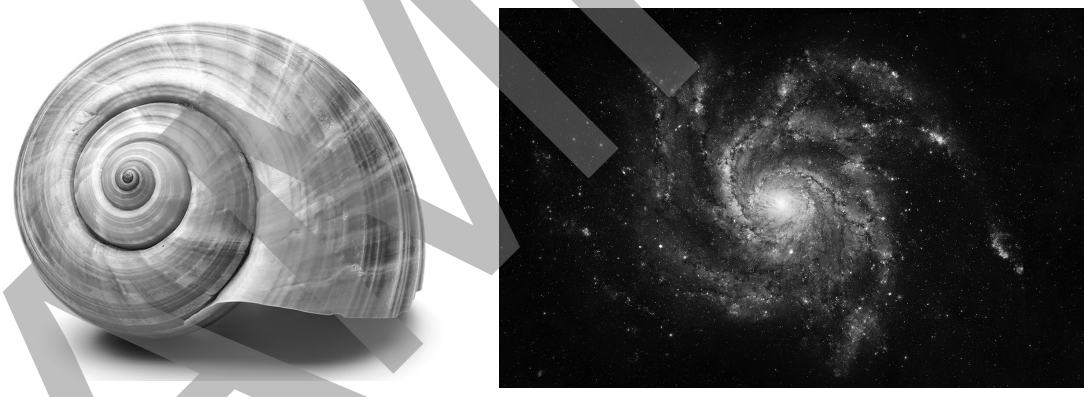
Scientists make their many discoveries by first observing natural phenomena, facts or events that exist. Some examples of natural phenomena are lightning, earthquakes, tornadoes, and so on. They then analyze the data from their experiments to identify, or recognize, patterns, relationships, and trends.

A pattern is something that happens or appears in a regular and repeated way or is a visible design in nature. A relationship is an aspect that connects two or more things that work together. In an experiment, scientists can study the relationship between variables. When they look for relationships between variables, they interpret the data by looking for patterns and trends. A trend is a noticeable change in something over time.

The practice of asking questions, identifying problems, finding relationships and trends, and explaining phenomena becomes a critical part of the scientific and engineering method. It helps you to better understand why things happen. Take a simple example of walking on hot sand on the beach. You know that sunlight warms the surface of Earth. That is observable. Therefore, when you walk on the beach, you experience that relationship between the sun and the hot sand.

Some patterns include the changing of seasons, the water cycle, and the phases of the moon. All are observable patterns. In the water cycle, the continuous movement of water from Earth to the atmosphere is an observable pattern. It is a relationship among the atmosphere, the ocean, and the land. As water moves continuously to the ocean, on land, and back into the atmosphere, the process repeats itself over and over. The pattern and relationship are that the sun provides the energy that evaporates the water, which goes back into the atmosphere, and comes back down again as precipitation.

A common design pattern you will find in the natural world is a spiral. Look at the seashell and the galaxy. They both have a spiral pattern, the galaxy being a much larger example.



A spiral is a common pattern of the natural world. You can see it in the seashell on the left and a much larger example in the galaxy on the right.

All scientific knowledge is based on patterns, relationships, and trends. From the data you gather in an investigation, you might find that trends repeat in predictable ways. The sequence is the order in which things are related. In science, a pattern is a regular sequence, or order, of things you can understand in nature. Scientists ask questions when observing patterns, and when something does not follow a known pattern, they investigate further to find and solve problems.

Cause and effect explains why something happens. In a cause-and-effect relationship, one is the direct result of the other. For example, if you leave your bicycle out in the rain, it might rust. The cause is leaving it out in the rain. The effect is the rust (because most metals will rust

Did You Know?

Rube Goldberg was an American comic book creator known for his funny cartoons and cause-and-effect machines in which one device would trigger a series of other things to happen. His drawings depicted cause-and-effect relationships in which complex machinery did simple tasks.

when exposed to water over time). Earth's rotation on its axis causes another pattern, an effect that you can observe. The position of Earth as it rotates causes sunrise, sunset, day, and night within a 24-hour period. Understanding cause and effect plays an important role in scientists and engineers making discoveries and solving problems.

Critical Thinking

1. What is a pattern in nature?

2. Where can you find the spiral pattern?

3. Why would it be important to analyze data that you gather?

4. If something does not follow a known pattern in your investigation, what would you do?

How Am I Doing?

★ What questions do you have?

★ Fill in the circle that shows how you are doing with the skill.

○ I am stuck. ○ I almost have it. ○ I understand the skill.

★ Practice

DIRECTIONS Read and answer each question carefully.

1 Which is **NOT** a cause-and-effect relationship?

Ⓐ It rained because too many droplets accumulated in the clouds.

Ⓑ You will get burned if you touch a hot iron.

Ⓒ The bridge collapsed because it was not structurally sound.

Ⓓ Manuel won the game because he wore his lucky red socks.

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2 Which is the **BEST** explanation for a pattern in the natural world?

Ⓐ Two or more things that are connected

Ⓑ Something that appears in a regular or repeated way

Ⓒ One thing that causes another thing to happen

Ⓓ One thing that is related to another

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3 Which statement is true?

Ⓐ Data is never predictable.

Ⓑ Data is fact; there are no patterns in data.

Ⓒ Repeated investigations are never the same.

Ⓓ From data, you can find trends that repeat in predictable ways.

4 One freight ship in the ocean crashed into another, spilling thousands of gallons of crude oil into the water and killing many plants and animals. Which is the effect?

Ⓐ Freight ships should not be in the ocean.

Ⓑ The spill killed many plants and animals.

Ⓒ One ship crashed into the other.

Ⓓ One ship was carrying too much weight.

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5 A volcano erupted. As a result, trees and homes were destroyed, animals were displaced from their homes, and weather patterns in the region changed. Which statement is true?

Ⓐ A volcanic eruption does not necessarily result in negative effects.

Ⓑ The eruption of the volcano did not cause the displacement of animals.

Ⓒ One major cause can have multiple effects.

Ⓓ A volcano is not an observable pattern.

★ Assessment

DIRECTIONS Read and answer each question carefully.

1 Jane watched television all night and did not study, so she failed her spelling test. Which is the effect?

Ⓐ She watched television all night.

Ⓑ She did not study.

Ⓒ She failed the test.

Ⓓ The test was too hard.

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2 Which is a pattern in the natural world?

Ⓐ Snowstorms occur every December.

Ⓑ The seasons change throughout the year.

Ⓒ Boys play football; girls play soccer.

Ⓓ The temperature in the summer months is always above 95.

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3 The plant died because it did not get enough water or sun. Which is the effect?

Ⓐ The plant died.

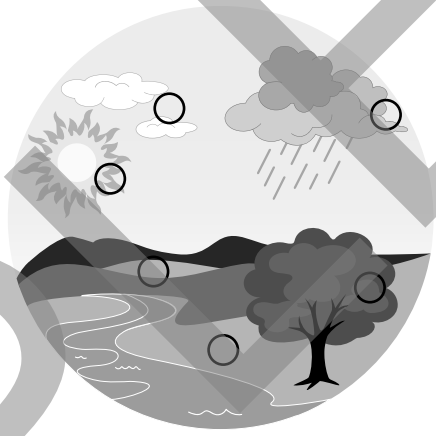
Ⓑ It did not get enough water.

Ⓒ It did not get enough sun.

Ⓓ It was probably neglected.

4 Which are causes for the water cycle?

Select **THREE** correct answers.



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5 Alfred woke up late and missed the bus. He did not go to school because he had no one to drive him. He played video games all day, and his mother was not happy. Which are causes and which are effects?

Write **ONE** correct answer in each box.

Did not go to school	Played video games

Woke up late

Cause		Effect
	→	Missed the bus
Had no one to drive him	→	
	→	Mother not happy

Exit Ticket

Now that you have learned about patterns and cause-and-effect relationships, answer the questions below.

1. Write one pattern you have observed in the natural world.

2. Write one cause-and-effect relationship you have observed in the natural world.