Shaping My Knowledge

Warm-up

First, write out key words related to science and the scientific method (*Isaac Newton, observation, physics*). Then, divide students into small groups and give each group a set of key words on small pieces of paper. Next, have one student pick one. Afterward, tell the other students in the group to ask yes/no questions until they guess the word. Finally, the first group to finish guessing all the words wins.

Teaching Tip

For Exercise 1
First, tell students to mingle. Then, read their questions from Exercise 1 aloud. Next, students give a thumbs-up if they think a question is interesting. At the end, students identify the most intriguing questions. Finally, record those questions on the board or a digital collaborative document.

Differentiation Strategy

For Exercise 3
Go to the Differentiation Strategies Bank and adapt this exercise using Strategy 6.

Flexi Exercises
(To adjust to students' needs, you can either use or not the activities below)

Exercise 4

Social Studies

What do you wonder about?

01 **Working with a classmate, fill in the organizer with some questions you have about the natural world, human life, or the universe.**
Answers will vary.

Our questions

02 **Read "An Ounce of Common Sense Is Worth a Pound of Theory." Identify the main topic of each paragraph.**

Paragraph 2 — 1. It describes the process of the scientific method.

Paragraph 3 — 2. It describes the difficulties and the benefits of using the scientific method.

Paragraph 1 — 3. It explains the importance of the scientific method. It also mentions who uses it.

03 **Read the text again. Complete the questions with the correct letter.**

1. What kinds of ___b___ do you like to observe?
2. How many times do you typically redefine your ___c___ before it is finished?
3. What is the most ___f___ part of the scientific method?
4. What was the first ___d___ that you ever derived?
5. Have you ever had to ___e___ another scientist's theory?
6. What can you do to prevent ___a___ in your investigations?

a. bias
b. phenomena
c. hypothesis
d. theory
e. fine-tune
f. arduous

An Ounce of Common Sense Is Worth a Pound of Theory

1. The beauty of science is that it is based on fact and observation, minimizing religious, political, or philosophical **bias**. Scientists do not simply invent and believe an idea, but follow a scientific method to support or disprove it. This method is so effective that it is used in the hard sciences, such as math and biology, and in the social sciences, such as sociology, using statistics and probability.
2. The scientific method follows multiple steps, starting with observing a **phenomenon**. Next, the problem is defined, and a hypothesis, a statement to be proven or disproven, is created. With the **hypothesis** defined, experiments must be designed and conducted to test it. The results could lead to the revision of the original hypothesis until, finally, using the outcome of the experiments, a **theory** is derived that can be used to predict the likelihood of further results.
3. Nevertheless, scientists constantly question theories to **fine-tune** them. Although the concept is simple, the process can be **arduous**. It might take scientists years, even decades, of repeated trial and error before the theory fits the observed facts. The scientific method ensures that theories are molded to fit observation and not the other way around, ensuring that we don't just believe what we want. Science safeguards the truth and guarantees that regardless of any personal predisposition, fact will prevail.

04 **With a classmate, imagine that you are interviewing a scientist about the scientific method. Ask one another the questions from Exercise 3.**

Shaping My Knowledge

Teaching Tip

For Exercise 5
First, tell students: *Welcome to the Hypothesis Lab! Your job as a group of scientific editors is to evaluate and complete research statements using logic, deduction, and correct grammar. Each incomplete theory or result needs proper reasoning. Your modals and conditionals are your scientific tools!* Then, divide students into small groups. Next, give each group an Experiment Folder with mixed-up sentence halves (12 halves total, including the ones in the book). After, students must match the clauses using correct modal and conditional structures and logical thinking. The rules are as follows: grammar must be accurate, logic must make scientific sense, each clause must be used only once, and groups must read all completed sentences aloud at the end. Each group selects two sentences to present to the class. Finally, other groups rate them on: logic, grammar accuracy, and creativity. Use simple voting: thumbs up or tokens.

Language Structures and Functions Tip

For Exercise 6
First, tell students to write out their sentence halves on paper strips. Then, students should exchange sentence halves with a classmate and assemble their classmate's sentences. If time allows and you deem necessary, review the grammar point in detail. Finally, in the plenary, some volunteers will share their sentences.

Differentiation Strategy

For Exercise 7
Go to the Differentiation Strategies Bank and adapt this exercise using Strategy 2a.

Wrap-up

First, ask students to work with a classmate to write their definition of the scientific method, including what it can be used for and who can use it. Then, ask pairs of students to compare their definitions to create one final version, incorporating elements from the different contributions.

Flexi Exercises
(To adjust to students' needs, you can either use or not the activities below)

Exercise 8

05 Match the sentence halves.

1. Scientists might need to modify their theories many times	a. that another team was working on proving the same hypothesis in another country.
2. Sheilla may have a paper published later this year	b. before they become accepted.
3. Jason couldn't have known	c. your work won't be supported by your peers.
4. You might have told me that my paper had been rejected	d. on her work on the atomic theory.
5. Although you can try to prove a theory without using the scientific method,	e. before I began to tell everyone about it!

06 Finish writing the sentences using a clause containing *can, might, could,* or *may.*
Possible answers
1. Before you claim I copy my work, you might / may check it first.
2. If I can get more experience in science before university, I might / may consider a career in it.
3. If my friend dedicates more time to studying, she can pass the physics test.
4. Since there were too many errors in the article in the well-known journal, it couldn't have been reviewed by peers before publishing.
5. Someone will always question your hypothesis even if you test it many times.

07 With a classmate, choose one of the ideas from Exercise 1. In the organizer below, design a series of experiments that you could conduct to answer one of your questions.
Answers will vary.

1 | 2 | 3 | 4

08 Using your ideas from Exercise 7, tell another group how your experiment plan follows the steps of the scientific method. Use the language below to help guide you.

We can investigate how...
We are thinking that we can start with a hypothesis that...
We might have to modify the hypothesis to...
Depending on the results, we may...