INSTRUCTIONS

Preparing to Read

The Scientific Method

Reader/Writer Notebook

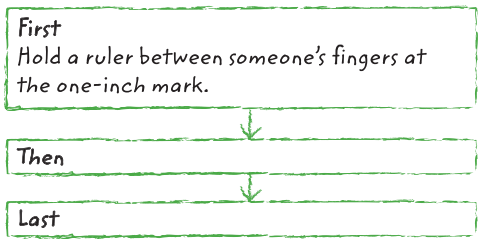
Use your **RWN** to complete the activities for this selection.

Informational Text Focus

Structure and Purpose of Instructions Effective instructions can tell you how to do anything from making a pizza to building a robot. It's important to read instructions carefully before you begin any project. The quality of your results—and sometimes your safety—depends on how well you read and follow instructions. Pay attention to these elements when you read instructions:

- **Headings** Large or boldface words that summarize each step.
- **Signal Words** Numbers and words like *first, next, then,* and *last* tell you the correct order to follow.
- **Tone** Most instructions are written in a direct style with few unnecessary words.
- **Technical Vocabulary** Many instructions include words that are related to the task. Recipes, for example, include cooking terms; instructions for experiments use scientific language.

Into Action A sequence chart can help you summarize the most important steps in any instructions. Create a sequence chart like the one below to show the steps of the experiment you will read about. You may need to add more boxes.



Vocabulary

formulated (FAWR myuh lay tihd) *v.:* formed in one's mind; developed. *Once she formulated her hypothesis, she could begin the experiment.*

correlate (KAWR uh layt) *v.:* show the connection between things. *It is important to correlate the results of your experiment to make sure that your cause and effect are really related.*

verify (VEHR uh fy) *v.:* show to be true; confirm. *To verify the results of an experiment, you must repeat it and get the same results.*

Language Coach

Word Forms The Vocabulary words above are all verbs. *Formulation, correlation,* and *verification* are noun forms of the Vocabulary words. In your *Reader/Writer Notebook,* jot down the definitions of these noun forms in your own words. Consult a dictionary if you need help.

Writing Focus

Preparing for **Constructed Response**

In your *Reader/Writer Notebook,* note how the writer of these instructions uses numbers, letters, and text features such as boldface to make the steps of the experiment clear and easy to follow.

Learn It Online

There's more to words than just definitions. Get the whole story on:

go.hrw.com L8-121 Go

Selection Resources

Collection 1 Resources, on-level practice and assessment, p. 37

Teacher One Stop™, on-level lesson plans and all print resources

Holt Audio Library

Holt Audio Library: Selections and Summaries in Spanish

Supporting Instruction in Six Languages

ThinkCentral Online Assessment, Selection Test

ThinkCentral Online Remediation

Preteach

Introducing Vocabulary

Read aloud the Vocabulary words and sample sentences. Then, have students respond to the following statements.

1. Explain how you formulated an opinion about a favorite movie.
2. How would you correlate the relationship between good study skills and good grades?
3. How might you verify that you learned an idea or strategy that a teacher taught you?

Language Coach

Use **Language Coach** to help English-language learners acquire word-attack skills. Provide students with words ending in *–ate,* such as *migrate, irritate,* and *abbreviate.* Write each word on the board and ask students to create new words by adding a suffix. Remind students to "drop" the e when adding *–ing* or *–tion.*

Informational Text Focus

Give students a copy of the Informational Focus graphic organizer (**Collection 1 Resources**). Have students use their responses to answer the questions on the Applying Your Skills page.

Writing Focus

Have students record examples of the use of numbers, letters, and text features in the instructions in their **Reader/Writer Notebooks.** Students can use their notes to complete the Writing Focus activity.

Learn It Online

Send students to **Word Watch** for audio pronunciations of each word, synonyms, antonyms, and brief histories of word origins. Preview at **go.hrw.com.**

go.hrw.com L8-121 Go

Direct Teach

Guided Practice

Model and Apply

- Provide students with copies of the Informational Text Focus graphic organizer for "The Scientific Method." (See **Collection 1 Resources.**)
- Model how to identify the most important steps in the experiment's instructions. Draw students' attention to the numbered list in the "Perform Experiments" section. Point out that the illustrations are visual representations of the numbered list. These details explain where to find the experiment's most important steps.
- Have students read through the "Perform Experiments" section before filling out the graphic organizer.

First
Hold a ruler between someone's fingers at the 1-inch mark.

↓

Then
Tell the person to catch the ruler after you drop it.

↓

Then
Record the person's reaction time by noting the measurement next to the place where he or she grasps the ruler.

↓

Last
Repeat the above steps for all test subjects.

INSTRUCTIONS



The Scientific Method

from **Current Science**

Read with a Purpose

Read the following selection to learn how to conduct your own experiment.

One of the ways that science differs from other branches of knowledge is that scientists follow their own special path of inquiry. That path is called the *scientific method*. The basic steps in the scientific method are as follows:

1. State the problem. A

Often the first step in the scientific method involves simply noticing something—making an observation. For example, you have a friend who is very good at sports. Your friend also seems to have very fast reflexes—he or she responds very quickly when a ball or a puck is coming his or her way.

Could it be that having fast reflexes is what has made your friend a star athlete? In asking yourself that question, you have come up with a *research question.*

2. Gather information.

To answer your question, you might begin by gathering information on the subject from science books and journals. You might try to find out whether other scientists have explored the same question. You might also try to find out as much as you can about human reflexes and how best to test them.

A **Informational Focus** Structure and Purpose Why are the headings numbered?

Selection Readability	
Easily Accessible **Accessible** Challenging	selection provides background information; chronological order; accessible theme
Lexile	**980**

Selection Summary

The seven basic steps in the scientific method are outlined, instructing readers how to conduct scientific experiments.

3. Form a hypothesis.

Using all of the information you've gathered, you are then ready to suggest a possible solution to your problem in the form of a *hypothesis,* or an educated guess. In this case, you hypothesize that having fast reflexes determines a person's success at sports.

Once you've formulated your hypothesis, you must test it. You must find evidence that either supports or disproves your hypothesis. B

4. Perform experiments.

In other words, you must perform an experiment. Experiments are performed according to specific directions. By following those directions, scientists can be confident that the information they uncover will clearly support or disprove the hypothesis.

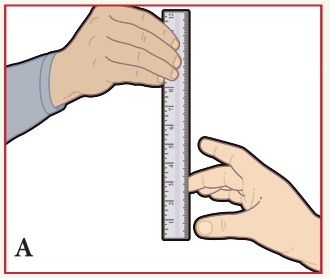
For a study of human reflexes, you might perform a reaction-time test following these directions.

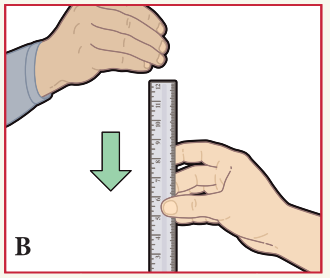
A. Hold one end of a ruler so that the other end is dangling between a subject's open thumb and middle finger. The 1-inch mark on the ruler should hang right between the subject's two open fingers.

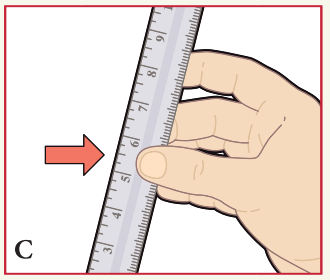
B. Without warning, drop the ruler. The subject must catch the ruler between his or her two fingers.

C. Note the spot where the subject caught the ruler. The lower the inch number at the point where the subject caught the ruler, the faster the subject's reaction time. Record the result. C

Perform the reaction-time test on many subjects who are the same age but who have achieved different levels of athletic success. Some subjects will be top athletes; others will be average athletes; still others will be people who don't play sports well at all.







B **Read and Discuss** What has the author told us about the scientific method?

C **Informational Focus** **Structure and Purpose** What structural element makes the instructions for this reaction-time experiment clear?

Vocabulary **formulated** (FAWR myuh lay tihd) *v.*: formed in one's mind; developed.

Think About/Talk About

Read with a Purpose Have students read the Read with a Purpose statement. Ask them to brainstorm a list of questions that they might answer by conducting experiments. Record students' questions on the board. As students read, help them make connections between their questions and instructions in the text.

Comprehension

A Informational Focus

Possible response: *The headings are numbered to make it easier to identify the steps in the scientific method.*

B Read and Discuss

Possible response: *The first step is to make an observation, or come up with a question. The next step is to gather information. Then, form a hypothesis, or a possible solution to the original question.*

C Informational Focus

Possible response: *The writer separates the steps with letters, gives specific examples, includes illustrations, and uses simple language.*

Extend the Discussion

Asking Questions The section "State the Problem" asks the question "Could it be that having fast reflexes is what has made your friend a star athlete?" What is another research question the observer might ask? ***Possible response:*** *What causes someone to have fast or slow reflexes?*

Differentiating Instruction

Readers Gaining Proficiency

To help students read "The Scientific Method," model how to read instructions. First, have students read all seven of the numbered steps. Then, have them read the information under each numbered head. This tells them that they can state the problem as a question. Have students rephrase the problem as a question. ***Possible response:*** *Does having fast reflexes affect a person's athleticism?*

Have students look for signal words when reading the instructions. Have students identify signal words. ***Possible response:*** *first, next, later.*

Ask students why signal words are important. ***Possible response:*** *They tell you the order to follow.* Make sure students understand all the words in the instructions. For example, these instructions use the words *formulated* and *subject.* Remind students that the textbook glossary, or a dictionary can help them learn the meaning of the words.

Think About/Talk About

Comprehension

Ⓓ Informational Focus

Possible response: *These terms are italicized because they refer to wording used in the actual steps. Italicizing the words draws the reader's attention to them and emphasizes their importance.*

? Extend the Discussion

Evaluating The last paragraph advises researchers to test subjects of varying athletic levels. Note that this evaluation is somewhat subjective. How should researchers define the characteristics that make some a good, average, or poor athlete?

Possible response: *Researchers might use criteria such as participation on athletic teams, athletic awards, opinions of coaches or spectators, self-assessment, or a series of athletic tests with targeted results for each level.*

Check for Understanding

Use the Read with a Purpose follow-up question to assess students' understanding. ***Possible response***: *Students may construct an experiment to understand the effects of pollution on specific ecosystems, build an experiment to study aerodynamics, or design an experiment to determine the best method of memorizing data.*



5. Record and analyze data.

Once all your subjects have been tested and you have recorded all your data, you must *analyze* the data. In this study, you will need to correlate your results. In other words, you will need to see whether there exists a match between the subjects' athletic ability and their individual scores on the ruler test. If the correlation is strong, you will find that top athletes did indeed have fast reaction times on the ruler test and poor athletes had slow reaction times on the ruler test.

6. Reach a conclusion.

With your evidence in hand, you can arrive at a *conclusion,* one that either supports or does not support the hypothesis. In this case, you might find, as many other scientists have found, that reaction time doesn't determine athletic achievement. Ⓓ

7. Repeat the process.

In order to be satisfied that the data and your conclusion were accurate, you must verify the results—that is, repeat the experiment. Before other scientists accept your conclusion, they may repeat the experiment, too.

Even if scientists accept your conclusion, one answer inevitably leads to at least another question. In this case, you might want to find out whether fast reflexes are something a person is born with or whether they can be learned. The pursuit of scientific knowledge never ends.

Read with a Purpose What experiments might you undertake?

Ⓓ **Informational Focus** **Structure and Purpose** Why are the terms *analyze* and *conclusion* italicized?

Vocabulary **correlate** (KAWR uh layt) *v.:* show the connection between things. **verify** (VEHR uh fy) *v.:* show to be true; confirm.

SKILLS FOCUS p. 125

Informational Skills
- Analyze the structure and purpose of instructions.

Vocabulary Skills
- Demonstrate knowledge of literal meanings of words and their usage.

Writing Skills
- Write instructions.

INSTRUCTIONS

Applying Your Skills

The Scientific Method

Practicing the Standards

Informational Text and Vocabulary

1. Which of these actions form the first step of the scientific method?
   - **A** Form an explanation for something confusing.
   - **B** Conduct an experiment to test your ideas.
   - **C** Notice something that you cannot explain.
   - **D** Make sure that the results of an experiment are accurate.

2. Which **text structure** tells you when to do the steps in these instructions?
   - **A** boldface heads
   - **B** instructional tone
   - **C** numbered list
   - **D** technical vocabulary

3. What is the **tone** of these instructions?
   - **A** Clear and direct
   - **B** Light and amusing
   - **C** Overstated and exaggerated
   - **D** Strong and emotional

4. When you *correlate* data, you show how the results are —
   - **A** important
   - **B** related
   - **C** perfect
   - **D** random

5. How can you *verify* the results of an experiment?
   - **A** Show that the results are always true.
   - **B** Share the results with others.
   - **C** Change the results to match your hypothesis.
   - **D** Throw out results that do not make sense.

6. A scientist who has *formulated* a hypothesis has —
   - **A** received results in a test
   - **B** developed an explanation
   - **C** tested his or her theory
   - **D** incorrectly tested it

Writing Focus Constructed Response

Create guidelines for students to follow during a fire drill. Use features such as numbering, lettering, and headings to structure the steps and ensure a safe outcome.

What Do You Think Now?

How can pursuing a career in science fulfill both one's personal wishes and those of nonscientists?

Compare and Contrast

Have students compare "Physical Science," "Hawaiian Teen Named Top Young Scientist," and "The Scientific Method." Use the following questions in a class discussion.

- How are text structures used in all three selections?
- Which type of informational text uses the most text structure? Which one uses the least? Why?
- In what order is information presented in each selection?
- What is the role of visuals in each selection?

Paired activity Provide students with plain text from a textbook page, a newspaper article, and the instructions for a process or assembling an object. Have students format the text with appropriate text structures, including images or figures.

Review

Independent Practice

Answers and Explanations

1. ***C*** *Researchers must identify something they cannot explain before taking the other steps.*
2. ***C*** *Instructions should be in a time-order sequence that signals to readers when to do something.*
3. ***A*** *Tone is the writer's attitude toward the subject. In instructions, a clear and direct tone assists readers in performing the tasks described.*
4. ***B*** Correlated *and* related *are synonyms.*
5. ***A*** Verify *means to show that the results are always true.*
6. ***B*** *A hypothesis should be formed before an experiment can be conducted.*

Writing Focus

Possible response: *Responses should be clear, succinct, and numbered or lettered. For example: 1. Get up from your desk. 2. Quietly walk to the nearest exit, and so on.*

What Do You Think Now?

Remind students that automobiles, bicycles, and airplanes are the result of scientific inquiry. These inventions help people travel long distances in short periods of time. Have students name other beneficial inventions.

Assess

Collection 1 Resources, Selection Test

ThinkCentral Online Assessment, Selection Test

Teacher One Stop™, editable Selection Test

Reteach

ThinkCentral Online Remediation