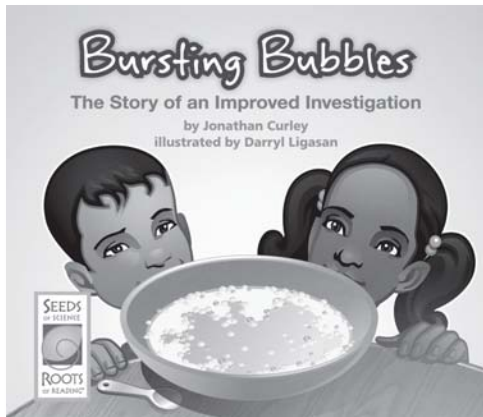


Teaching Procedural Writing

with *Bursting Bubbles: The Story of an Improved Investigation* from *Seeds of Science/Roots of Reading*®



Introduction

This strategy guide introduces an approach for teaching students how to write scientific procedures. Learning to write scientific procedures enables students to communicate about investigations the way that scientists do. This guide includes an introductory section about scientific procedural writing, a description of how to teach this strategy with many science texts, and a plan for teaching students about writing scientific procedures with the *Seeds of Science/Roots of Reading*® book *Bursting Bubbles: The Story of an Improved Investigation*.

Book Summary

Bursting Bubbles: The Story of an Improved Investigation is a realistic fictional account of two kids, Daisy and Pablo, who notice a chemical reaction taking place in the kitchen. This observation leads them to design an investigation using yeast, sugar, and water at different temperatures. As they investigate, they make a series of mistakes. Each time they notice a mistake, they make their investigation a little better. This book models how to plan, carry out, and communicate about an investigation, while also highlighting common points of difficulty in the investigation process, such as controlling variables, making comparisons, taking measurements, and making explanations.

About This Book

Reading Level

Guided Reading Level*: R

Key Vocabulary

chemical reaction, data, experiment, explanation, hypothesis

Text Features

bold print, bulleted lists, glossary, illustrations, tables

*Guided Reading Levels based on the text characteristics from Fountas and Pinnell, *Matching Books to Readers*.

Science Background

Chemical Reactions

During chemical reactions, substances change to form new substances. For example, when sugar, water, and yeast are mixed together, new substances are formed. One of these new substances is the gas carbon dioxide, which makes bubbles in the mixture. These bubbles are what cause bread to rise. In this chemical reaction, the temperature of the water affects the rate and amount of carbon dioxide produced. Warmer water causes more carbon dioxide to be produced; however, extremely hot water harms the yeast, so less carbon dioxide is produced.

Scientific Experiments

Conducting experiments is one way that scientists investigate the natural world. In an experiment, multiple tests are compared with one another, with one changed variable each time. Scientific experimentation, like all investigations, involves choosing a question and generating a hypothesis. Then, the experiment is carried out, and the results are observed. Careful experimentation relies on detailed, step-by-step procedures that can be replicated multiple times. Scientists also think about how to record data and share the results of the experiment with other scientists.

About Procedures

Procedural text describes how to do or make something. Many types of procedural text, such as recipes, repair manuals, or assembly instructions, are commonplace. Procedures are used by scientists as they conduct investigations and experiments. Scientists use procedures to record the materials they use and the steps they follow to conduct an investigation. Scientists must consider how to make their procedures as clear and detailed as possible; having a clearly written procedure enables other scientists to analyze the results and replicate the investigation. Learning the characteristics of a scientific procedure familiarizes students with one way scientists use writing to communicate.

Teaching Procedural Writing

The following guidelines can be used to teach students how to write a scientific procedure.

- Gather examples of procedural text. Some sources are recipes, how-to books, craft and hobby instructions, knitting or sewing patterns, game directions, furniture assembly instructions, computer manuals, or lesson plans.
- Introduce students to the purpose of procedural writing, which is to explain how to do something in a way that a reader can clearly follow.
- Have students work in pairs or small groups to examine the examples of procedural writing that you collected. Discuss the characteristics that the different procedures have in common. For example, highlight the title, list of materials, and numbered steps in each procedure. (See the box on this page for characteristics of a procedure.)
- Have students write a procedure for a simple task, such as making a sandwich or tying a shoelace. Invite students to act out the steps, one at a time, and describe each step in clear detail.
- Have students examine the lists of materials in their examples of procedures. Point out the use of numeric quantities, specific measurements (e.g., 3 teaspoons, 100 milliliters), and detailed descriptions of the required materials.

Characteristics of a Procedure

A procedure...

- tells how to do or make something.
- has a title.
- lists materials at the beginning.
- has numbered steps.
- includes specific measurements.
- includes details that help the reader know exactly what to do.
- uses command verbs.

- Next, have students examine the steps of the procedure (these are usually numbered). Have students identify the imperative (command) verbs that are used in each step of the instructions (words such as *measure*, *put*, *chop*).
- Point out any adverbs (such as *carefully*, *slowly*) and/or adjectives (such as *plastic*, *wooden*, *permanent*) that add specificity to the procedure. Emphasize that these details are important to help others carry out the procedure exactly as the author intended.
- Explain that scientists use procedures when conducting investigations and that procedures in science also have lists of materials, numbered steps, and detailed instructions.
- Conduct a simple investigation, such as mixing baking soda and vinegar. Then, as a class, write a scientific procedure for the investigation. Repeat the investigation following the procedure the class wrote and revise any parts that need more clarity.
- Provide opportunities for students to practice writing procedures in science and in other subjects. You may wish to use the Writing a Procedure copymaster, included in this guide, to provide a format for students to follow. Students could write procedures for investigations they conduct in science, as well as in mathematics (e.g., how to measure the area of their desk), physical education (e.g., how to shoot a free throw), or general study skills (e.g., how to complete their homework).
- Have students follow one another's procedures, then provide feedback to one another on how to make their procedures clearer.

Teaching Procedural Writing with *Bursting Bubbles: The Story of an Improved Investigation*

Getting Ready

1. Make a copy of the Writing a Procedure copymaster for each student.
2. Prepare a chart listing the characteristics of a procedure. (See the box on the previous page.)

During Class

1. Introduce *Bursting Bubbles: The Story of an Improved Investigation* and explain that this book tells the story of two kids who learn about conducting scientific investigations as they investigate a chemical reaction.
2. Read the book in a way that is consistent with your classroom routines, giving students as much independence as possible.
3. After reading, engage students in a discussion about what Daisy and Pablo learn about investigating as they attempt to answer their question. [Test one thing at a time, make comparisons, measure materials and time, record data, share results.]
4. Discuss how Daisy and Pablo conduct their experiments. Explain that when scientists conduct an experiment, they write a scientific procedure so they, or another scientist, can repeat the experiment or analyze the results. Explain that you will show students how to write a procedure using one of Daisy and Pablo's experiments described in the book.
5. Have students turn to page 11 and reread the last two paragraphs to identify the materials that Daisy and Pablo used. [Hot water, bottle, sugar, yeast, balloon.] Write a list of these materials on the board. Label it "Materials." Explain that procedures always have a list of materials at the beginning.
6. Next, have students reread the last two paragraphs on page 11 again to determine the steps that Daisy and Pablo followed. Write these steps in order on the board. [1. Put some hot water into an empty water bottle; 2. Measure a spoonful of sugar and add it to the bottle; 3. Add a spoonful of yeast; 4. Stretch the opening of the balloon over

the mouth of the bottle; 5. Watch the bottle.] Title this section of the procedure "Steps" and explain that a procedure always has a list of numbered steps for the reader to follow.

7. Introduce the Characteristics of a Procedure chart and discuss each characteristic with the class. Ask students to evaluate the procedure you wrote using the list of characteristics. Encourage students to identify places where the procedure could be improved and make changes as needed.
8. Distribute the Writing a Procedure student sheets and review the parts of a scientific procedure. Explain that the class will now write a scientific procedure for the experiment Daisy and Pablo conducted on pages 14–19 of the book.
9. Ask students to turn to pages 14–15 and review the steps that Daisy and Pablo took to begin their experiment. Highlight the step about Daisy's dad helping with the very hot water, and remind students to include this in their procedure. Point out that students can also use the illustrations as a source of information about Daisy and Pablo's experiment.
10. Encourage students to work with partners to identify the materials and steps, and then record these on their student sheets. Remind students to refer to the Characteristics of a Procedure chart to make sure that they have included materials, steps, and enough details to make the procedure easy to follow.
11. When students have completed their procedures, have pairs switch papers with another pair and evaluate their procedures, suggesting changes as necessary. Discuss the importance of having a clear and detailed procedure in order to conduct an experiment.

Independent Extension

Have students revisit the data table on page 18 and the explanation on page 22 of *Bursting Bubbles*. Then pose the question "Why do you think it took so long for the balloon on the bottle with cold water to inflate?" Encourage students to explain the answer to a classmate.

About Strategy Guides

A six-page strategy guide is available for each *Seeds of Science / Roots of Reading*[®] student book. These strategies support students in becoming better readers and writers. They help students read science texts with greater understanding, learn and use new vocabulary, and discuss important ideas about the natural world and the nature of science. Many of these strategies can be used with multiple titles in the *Seeds / Roots* series. For more information, as well as for additional instructional resources, visit the *Seeds / Roots* Web site (www.seedsofscience.org/strategyguides.html).

Available Student Books for Grades 4–5

Nine engaging student books are now available from *Models of Matter* and *Chemical Changes*, each with a corresponding strategy guide. The books are part of the *Seeds of Science / Roots of Reading*[®] curriculum program described on page 6. Eighteen student books from the remaining grade 4–5 units (*Planets and Moons* and *Aquatic Ecosystems*) are currently in development and will be available in spring and summer 2010.

| <i>Chemical Changes</i> | |
|---|---|
| Strategy | Student Book |
| Teaching Scientific Explanation Writing | <i>Chemical Reactions Everywhere</i> |
| Posing Investigation Questions | <i>Handbook of Chemical Investigations</i> |
| Teaching Text Structure | <i>What Happens to the Atoms?</i> |
| Teaching Procedural Writing | <i>Bursting Bubbles: The Story of an Improved Investigation</i> |
| Promoting Word Consciousness | <i>Communicating Chemistry</i> |
| <i>Models of Matter</i> | |
| Strategy | Student Book |
| Teaching Summary Writing | <i>Made of Matter</i> |
| Using Roundtable Discussions | <i>Break It Down: How Scientists Separate Mixtures</i> |
| Interpreting Visual Representations | <i>Phase Change at Extremes</i> |
| Teaching About How Scientists Make Inferences | <i>Science You Can't See</i> |

Extend Learning with *Seeds of Science/Roots of Reading*®

The strategy featured in this guide is drawn from the *Seeds of Science / Roots of Reading*® curriculum program. *Seeds / Roots* is an innovative, fully integrated science and literacy program.

The program employs a multimodal instructional model called “Do-it, Talk-it, Read-it, Write-it.” This approach provides rich and varied opportunities for students to learn science as they *investigate* through firsthand inquiry, *talk* with others about their investigations, *read* content-rich books, and *write* to record and reflect on their learning.

Take advantage of the natural synergies between science and literacy instruction.

- Improve students’ abilities to read and write in the context of science.
- Excite students with active hands-on investigation.
- Optimize instructional time by addressing goals in two subject areas at the same time.

To learn more about *Seeds of Science / Roots of Reading*® products, pricing, and purchasing information, visit www.seedsofscience.org



Chemical Changes Science and Literacy Kit



Developed at Lawrence Hall of Science and the Graduate School of Education at the University of California at Berkeley.

Seeds of Science/Roots of Reading® is a collaboration of a science team led by Jacqueline Barber and a literacy team led by P. David Pearson and Gina Cervetti.

© 2012 The Regents of the University of California

Published and Distributed by



Bursting Bubbles: The Story of an Improved Investigation Strategy Guide