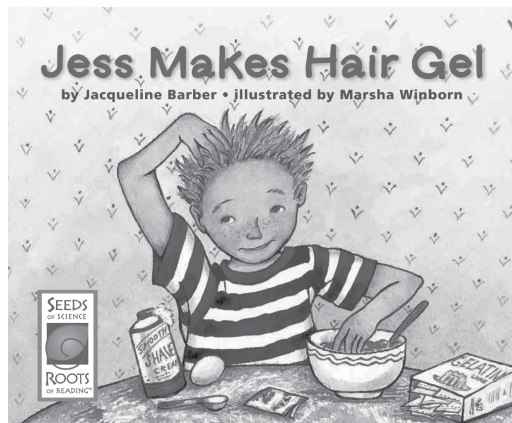


## Teaching About the Nature of Science

with *Jess Makes Hair Gel*  
from *Seeds of Science/Roots of Reading*<sup>™</sup>



### Introduction

This strategy guide introduces an approach for teaching about the nature of science. Learning about the nature of science helps students understand that science is a process for inquiring about the world. Students learn about the scientific enterprise when they read about how scientists pose questions and engage in investigations. This guide includes an introductory section about the nature of science, a general overview of how to teach this strategy with many science texts, and a plan for teaching about the nature of science with the *Seeds of Science / Roots of Reading*<sup>™</sup> book, *Jess Makes Hair Gel*.

### Book Summary

*Jess Makes Hair Gel* is about a boy who sets out to make his own hair gel. In the book, Jess identifies the properties of a good hair gel and then tests different ingredients to see which have those properties. After conducting tests on several ingredients, Jess realizes he needs to expand the list of properties. Jess then creates a new hair-gel mixture based on what he has learned. With the information Jess learns from his tests, he is able to solve problems he encounters and create a great hair gel. This book models the steps of the design process—including setting a goal, recording data, and evaluating results—in a student-friendly way.

### About This Book

#### Reading Level

Guided Reading Level\*: K

#### Text Features

book description, glossary, bulleted lists, about the author, bold print, italic print, illustrations, tables

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

### Science Background

#### About Properties of Substances

A central idea in physical science is that substances can be identified by their unique properties. Scientists use *physical properties* (e.g., color, odor, density, freezing point, melting point, solubility) and *chemical properties* (e.g., reactivity with other chemicals, pH) to distinguish between substances and decide which are best used for specific purposes.

#### About the Design Process

People in many professions employ a design process when they are inventing something new or improving upon something that already exists. *Jess Makes Hair Gel* models the design process using the following steps:

- Decide on the desired properties of a new mixture.
- Test ingredients separately and together.
- Compare the results to the list of properties to determine if the mixture meets the goals.
- Try again if the properties are not close enough.
- Record a recipe that describes how to make the final mixture.

The process is not always linear; steps may be repeated, skipped, or blended together.

## About the Nature of Science

Science is a particular way of learning about and understanding the natural world. Scientists think and act in ways that are different from people in other professions. Learning about the nature of science helps students understand how knowledge about the natural world is developed by the scientific community. For example, scientists continually make and revise explanations based on evidence gathered through careful observation. This knowledge helps students understand that science is not an accumulation of facts; it is a process for studying the natural world. Furthermore, understanding how science is conducted helps students emulate the practices of scientists when students engage in scientific investigations. Learning about the nature of science can also generate student interest in science.

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## Teaching About the Nature of Science

The following guidelines can be used to teach about the nature of science with texts that discuss the work of real scientists or show the processes of scientific inquiry.

- Select an appropriate book or article. Possibilities include biographies of scientists, interviews with scientists, descriptions of inventors and inventions, and books featuring children who act like scientists as they investigate a question.
- Discuss the nature of science with students. Point out that science is a way of learning about the world, and scientists have particular ways of investigating, writing, and talking. Tell students that learning about what scientists do can help them understand science ideas. You might discuss the ways that science is different from other ways of learning about the world, such as art or history. For example, scientists ask questions about the natural world, and they answer their questions by looking for evidence and by conducting investigations.
- Create a class chart titled “What Scientists Do.” Ask students what they think scientists do in their work. Record students’ ideas.

## Practices of Science

Ask questions.  
Design new things.  
Make predictions or hypotheses.  
Read about the work of other scientists.  
Work with other scientists.  
Make observations.  
Use tools, models, and computers.  
Record and organize data.  
Make explanations from evidence.  
Solve problems.  
Talk and write about investigations.

- When students read the text you have selected, ask them to pay special attention to parts of the text that illustrate what scientists do (e.g., how they conduct their work, what kinds of questions they ask). You may wish to have students use the What Scientists Do copymaster included with this guide to focus their reading.
- Continue the class discussion about what scientists do. After reading, add to the class chart. The Practices of Science box (above) lists ideas that you might wish to include on the class chart.
- Focus on one science practice that is well illustrated in the text students have read (e.g., using evidence to answer questions, making observations, working with other scientists). Review parts of the text that highlight the practice you have chosen. Ask students questions such as “Why is it important for scientists to (do this practice)?” “How did (doing this practice) help this scientist answer her question?” “What are some ways that other scientists might (do this practice)?”
- Maintain the What Scientists Do class chart on an ongoing basis. When students conduct hands-on science activities and read other books about scientists, refer to the What Scientists Do class chart. Continue adding to the list of practices and discussing how scientists engage in their work.

## Teaching About the Nature of Science with *Jess Makes Hair Gel*

*Jess Makes Hair Gel* describes a number of important science practices, including setting goals, making observations, recording and organizing data, and learning from failures or surprising results.

### Getting Ready

1. Make a photocopy of the What Scientists Do copymaster for each student.
2. Begin a class chart by writing “What Scientists Do” at the top of a piece of chart paper and posting it in a visible place.

### During Class

1. Read the book in a way that is consistent with your classroom routines, giving students as much independence as possible. (This first read will help students become familiar with the book’s content so they can pay close attention to the information about the nature of science on a second read.)
2. Tell students they will now focus on what scientists do in their work by reviewing the book and thinking about what Jess did that was similar to what scientists do. Tell students that learning about what scientists do will help students understand science ideas and learn more about how science works.
3. Explain that science is a process, and it is a particular way of finding out about the world. Say, “Scientists investigate the world differently than people in other sorts of jobs. For example, both fiction writers and scientists look carefully at the world, but their work is different in many ways. What are some things you think fiction writers and scientists do differently?”
4. As a class, discuss what scientists do. Say, “Imagine a scientist doing her work—for example, trying to make a medicine taste better. What kinds of things does she do?” Record students’ ideas on the What Scientists Do class chart.
5. Distribute a copy of the What Scientists Do student sheet to each student and have them record the title of the book in the space provided. Have students reread the book and

explain that they should answer the three questions on their student sheets about what Jess does that is like a scientist. Possible responses include: 1. What ingredient would make his hair look shiny?, page 3; 2. Jess tested each ingredient, page 6; 3. The corn syrup seemed too thin, page 7.

6. When students have finished reading, ask, “As Jess investigated, what did he do that was similar to what scientists do?” Add students’ responses to the class list of science practices. If necessary, help students rephrase responses about the specifics of what Jess did so their responses reflect the general practices of scientists. For example, if a student says, “Jess tested gelatin, shaving cream, and corn syrup,” you could respond, “So, we know that scientists test many substances when they are making a mixture.”
7. Discuss Jess’s use of evidence. Ask, “How did Jess decide which substance made a good hair gel?” [He tested the substances, made observations, and drew conclusions based on evidence.] Emphasize that Jess didn’t guess which substance would be best or base his conclusion on people’s opinions. He used evidence gathered by testing different ingredients. Emphasize that all scientists base their answers to questions on evidence. Record this information on the What Scientists Do class chart.
8. Ask students to reflect on what they have learned about using evidence in science by considering ways that other scientists might use evidence. Ask, for example, “What kind of evidence might a scientist who studies bird habitats use?” [Observations of birds in the wild, nests, birdsongs, migration patterns.]

### Independent Extension

Have students reread pages 9–10 of *Jess Makes Hair Gel*. Ask students to write a response to the question “What do you think scientists do when their tests don’t come out the way they expected?” [Change their ideas, make more observations, try again, don’t give up, etc.]

Name \_\_\_\_\_ Date \_\_\_\_\_

## **What Scientists Do**

Title of book \_\_\_\_\_

**As you read the book, notice what the scientist in the book does in his or her work.**

**1. What are some questions that the scientist is trying to answer?**

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**2. How does the scientist investigate his or her questions?**

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**3. What evidence did the scientist find?**

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## 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* website (<http://www.seedsofscience.org/strategyguides.html>).

## Available Student Books for Grades 2–3

Twenty-three engaging student books are now available, each with a corresponding strategy guide. The books are part of the *Seeds of Science / Roots of Reading*™ curriculum program described on page 6. Four *Gravity and Magnetism* student books and strategy guides will be available in 2009.

<b>Soil Habitats</b>	
<b>Strategy</b>	<b>Student Book</b>
Using Discourse Routines with Science Texts	<i>Into the Soil</i>
Using the Cognates Strategy	<i>Walk in the Woods</i>
Connecting Science Words and Everyday Words	<i>What Are Roots?</i>
Teaching About the Nature of Science	<i>Talking with a Habitat Scientist</i>
Teaching Text Structure	<i>Handbook of Forest Floor Animals</i>
Using Text Features	<i>Earthworms Underground</i>
Taking Notes Based on Observations	<i>My Nature Notebook</i>
Making Sense of Data in Science Texts	<i>Snail Investigations</i>
Using Discourse Circles	<i>Without Soil</i>
<b>Shoreline Science</b>	
<b>Strategy</b>	<b>Student Book</b>
Teaching Vocabulary with Science Texts	<i>Beach Postcards</i>
Teaching Concept Mapping	<i>What Belongs on a Beach?</i>
Teaching Scientific Explanations	<i>Gary's Sand Journal</i>
Interpreting Visual Representations	<i>What's Stronger? The Forces That Cause Erosion</i>
Using Text Features	<i>What Lives on a Sandy Beach?</i>
Teaching About Multiple Meaning Words	<i>My Sea Otter Report</i>
Searching for Information in Science Texts	<i>Handbook of Sandy Beach Organisms</i>
Teaching Text Structure	<i>The Black Tide</i>
Teaching About the Nature of Science	<i>Shoreline Scientist</i>
<b>Designing Mixtures</b>	
<b>Strategy</b>	<b>Student Book</b>
Using Discourse Circles	<i>What If Rain Boots Were Made of Paper?</i>
Using Anticipation Guides	<i>Solving Dissolving</i>
Teaching Scientific Explanations	<i>Handbook of Interesting Ingredients</i>
Teaching Text Structure	<i>Jelly Bean Scientist</i>
Teaching About the Nature of Science	<i>Jess Makes Hair Gel</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](http://www.seedsofscience.org)



**Soil Habitats 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.

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