




Seeds of Science/Roots of Reading
81 New and Engaging Science Books



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LHSTM
Lawrence Hall of Science

a curriculum
development *and*
research project




Delta Education
...because children learn by doing.



Goals

- Introduce the books from the Seeds of Science/Roots of Reading integrated science-literacy curriculum
- Discuss how text can support inquiry
- Discuss how students can inquire into text


- What are some challenges to using text in science class?



Typical concerns about using text in inquiry science

- Concerns about the quality of science texts
- Concerns about the misrepresentation of the scientific enterprise in text
- Concern that introducing text introduces a vocabulary teaching burden
- Concern that text will eclipse discovery

- Why would you want to use text in science class?



Why text in science?

- Not everything we want students to know about science can be learned firsthand in classrooms
- Reading is an authentic way that scientists and nonscientists learn about science
- Reading is an essential act of inquiry—students read to find out
- Science can provide an engaging and authentic context for learning to read

Using Text to Support Inquiry

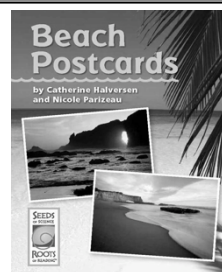
- Text can support, not replace, inquiry science.
- Text can do more than provide the answers.
- Science is an engaging context for developing reading skills, strategies, and habits.
- Reading to find out is an act of inquiry.

Using Text to Support Inquiry



Both text and experience provide students with evidence about the natural world.

Read about beaches



A Rocky Beach

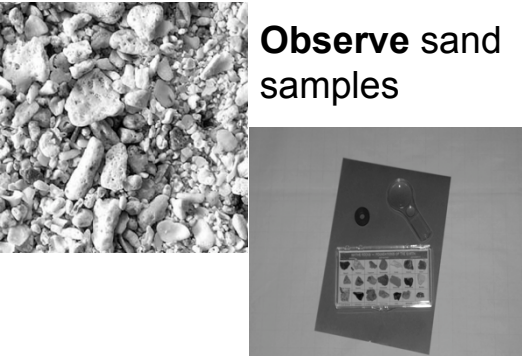
From the Great Lakes
Dear Linn,
The picture on this postcard looks a lot like the beach where I am sitting. I am on the shore of a Great Lake. The beach is covered with rocks and pebbles. They crunch when I walk. The sand is strong. Waves are crashing onto the beach. I can see driftwood, logs, and an old shoe on the rocks. The wind and waves carried these things to the beach.
Love, Jo

Rocky beaches are covered with rocks and pebbles. Some of the rocks are big. The pebbles are small. Rocks and pebbles get to the beach in many ways. Rocks can fall onto the beach from cliffs. Rocks on the beach can break and become pebbles. Rocks and pebbles can be carried to the beach by waves or rivers.

There is no sand here, but this is still a beach.

Investigate a model beach






Observe sand samples

Read to find out how a shoreline scientist observes sand



The Color of Sand

Sand comes in all different colors. Color is important evidence. It helps me figure out what the sand is composed of.




Black sand is often composed of **lava rock**. Hot lava sometimes flows from **volcanoes** to the ocean. The ocean cools the lava. It turns into hard, black rock. Waves crash on the lava rock. The rock breaks into smaller pieces and becomes sand. Then the waves carry the sand grains to the beach.

Some white sand comes from **coral**. Coral animals live stuck together in the ocean, making up a **coral reef**. Waves break off pieces of the coral reef. The hard parts of dead coral animals break into sand. Waves carry the sand to the beach.

Some white sand comes from shells. Clams and other animals with shells live in the water near the beach. After they die, waves break their shells into sand.

Discuss findings in expert groups and write reports



Roles of Text in Inquiry Science

Provide context	Connect to the world outside the classroom
Deliver content	Read to learn about science
Model	Demonstrate a process or disposition
Support secondhand investigations	Provide data for students to interpret
Support firsthand investigations	Provide information for investigations

from Cervetti, G.N. & Barber, J. (2009). Text in hands-on science. In Hiebert, E. H. & Sailors, M. (Eds.) *Finding the Right Texts: What Works for Beginning and Struggling Readers*. New York: The Guilford Press.

Providing Context

- Introduce domain and/or context
- Invite students to engage with the context
- Connect to the world outside the classrooms

Providing Context

What If Rain Boots Were Made of Paper?

Paper rain boots would be a problem. That's why rain boots are made of rubber.

- Rubber bends, so it's easy to slip boots on our feet.
- Rubber is strong, so it lasts a long time.
- Rubber keeps out water, so our feet stay dry.

Rubber is a great material for making rain boots. Maybe we should make everything out of rubber!

What if guess we're made of rubber?
Would food bounce out onto the floor?
Would the pants melt?
Would our food ever get cooked?

Providing Context

Walk in the Woods

Scientists study the natural world. Amoret is a soil scientist. She studies soil and what makes soil. Amoret looks everywhere for evidence of soil being made.

Do you wonder where soil comes from? Let's go for a walk in the woods with Amoret. Let's see what we can find!

Amoret takes a handful of soil. She can list all the things you can see in soil. Soil comes from rocks breaking down. It also comes from dead organisms. The dead organisms decompose. That means they break down into smaller and smaller pieces. Then they become part of the soil. Water and air that run with these things are part of the soil, too.

Modeling

- Model inquiry processes
- Model nature of science
- Model literacy processes

Modeling

Why Do Scientists Disagree?

But Galileo's telescope is used to observe the stars. It's not used to observe the Earth. Galileo's telescope is a just telescope.

When scientists disagree, they compare their values. They use signs and make comparisons on the same set of points. Scientists use the signs to see what they are in the same way. They use the signs to see what they are in the same way. They use the signs to see what they are in the same way.

Modeling

Jess Makes Hair Gel

Jess used a glue stick on his hair. It wasn't shiny at all, but you should have seen the splash! When they dried, they were as sharp as spines.

Jess remembered what he had learned on he would remember. He made a table in his notebook. He used science words he had learned in school. Instead of "ingredients," Jess wrote "substances." Substance is the word scientists use for "ingredients."

Jess compared the substances. Only one gelatin made his hair shiny and spiky. But there were problems with the first gelatin. Who wants green hair? Who wants to smell like lime?

Substances	Looks shiny	Makes spiky	Notes
Fluorespon	yes	yes	Foamy
Fluorespon	no	yes	very foamy
Egg whites	yes	yes	hair float
Corn syrup	no	no	too thin
Lime gelatin	yes	yes	green, smells like lime
Clear gelatin	no	yes	hard when dry

Supporting Firsthand Investigations

- Provide information that facilitates firsthand investigations
- Support students in making sense of firsthand investigations
- Inspire firsthand investigations

Supporting Firsthand Investigations

Handbook of Interesting Ingredients

by Jacqueline Barber

Flour

HOW IT LOOKS
Flour is powder. Different kinds of flour may be white, cream, or yellow.

PURE SUBSTANCE OR MIXTURE?
Flour is a mixture. It contains starch, sugar, proteins, fat, and some other substances.

WHERE IT COMES FROM
Flour is made from the ground-up seeds of wheat, corn, or rice. In the United States, people use mostly wheat flour.

IMPORTANT PROPERTIES

- Flour does not smell or have much flavor unless it is cooked. Cooked flour smells and tastes like bread.
- Flour is a **poor conductor** of heat. A little bit of the flour will dissolve in water, but most of the flour doesn't dissolve.
- Flour becomes sticky if you mix it with water. When the mixture dries, it becomes hard.
- Wheat flour and a liquid on hand, do have various uses.

WHAT IT'S USED FOR
Flour is used for making bread, cakes, and many other kinds of food. Because flour makes mixtures thick, it is also used to make thick soups.

CAUSE AND EFFECT

- Flour makes a mixture sticky.
- Flour makes a mixture thick.
- Flour makes mixtures hard when they dry.

Flour is the main ingredient in bread.

Supporting Firsthand Investigations

What Happens to the Atoms?

by Suzanna Loper

EXPLANATION

Sugar and water do not react when they are mixed. The mixture of sugar and water will spread evenly, and when the water dries up, the sugar will still there. The sugar and water did not change into new substances, so a chemical reaction did not happen.

Sugar molecules are made of carbon, hydrogen, and oxygen atoms. Water molecules are made of hydrogen and oxygen atoms. When sugar is dissolved in water, the sugar molecules separate from one another and mix throughout the water. But the atoms in the sugar and water molecules do not rearrange. The sugar and water molecules are still sugar and water molecules, even after they are mixed. This means a chemical reaction did not happen.

KEY

- Carbon atom
- Oxygen atom
- Hydrogen atom

Supporting Secondhand Investigations

- Provide data for students to interpret
 - Numeric data
 - Tabular data
 - Graphs, maps, and charts
 - Photographs and scientific illustrations

Supporting Secondhand Investigations

Snail Investigations

by Gina Corvetti
Illustrated by Cheryl Mandenhall

Snail Observations

Snail	Color	Size	Speed
Snail 1	Yellow	Small	Fast
Snail 2	Yellow	Medium	Medium
Snail 3	Yellow	Large	Slow

How Many Times Does It Take?

Surface	How Many Times Does It Take?
Table	1
Chair	2
Carpet	3
Wood	4
Grass	5
Asphalt	6

For words in her notebook that she can't read, she has a list of words to look up.

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Supporting Secondhand Investigations

Sky Notebook

by Ginger Loper and Suzanna Loper

Clouds

Clouds are made of water droplets. They are made of water droplets that have condensed together. They are made of water droplets that have condensed together.

Temperature

Temperature is the amount of heat energy in an object. It is measured in degrees Celsius or degrees Fahrenheit.

Humidity

Humidity is the amount of water vapor in the air. It is measured in grams per cubic meter.

Wind

Wind is the movement of air from one place to another. It is caused by differences in air pressure.

Pressure

Pressure is the force exerted on an object by the air around it. It is measured in pascals.

Delivering Content

- Deliver science information
- Provide information explanation about unobservable phenomena

Delivering Content Handbook of Sandy Beach Organisms

Sanderlings

How do they survive in the sandy beach habitat?

Beach sanderlings live at the shoreline. They feed on bits of food on the sand and the beach wash.

How do they get the food they need?

Sanderlings are great diggers. Sanderlings hunt for their food when the waves crash. Sometimes the waves lift the sand into the air. Sanderlings run and catch the sand before they dig it again. Sanderlings are not beach boppers that leave the beach wash.

How do they protect themselves?

Sanderlings have sandshoes. Sanderlings tie together in a rock to the side. To keep the sand from blowing away, they dig a hole in the sand. They pull the other leg in under them. This makes Sanderlings run quickly up the beach to the safe beach washing waves.

Herring gulls

How do they survive in the sandy beach habitat?

Herring gulls find a lot of food to eat on the beach. They also find and feed food in the shallow water. Gulls along the beach are great sand diggers.

How do they get the food they need?

Gulls will eat almost anything. They often eat their own. They feed on the ocean. Gulls are also predators. They hunt for crabs, clams, fish, and other small animals. Gulls have strong, thick beaks to tear their food.

How do they protect themselves?

Herring gulls do not have many predators. The gulls are so quickly they can escape. Gulls usually make nests in shells. Gulls also dig holes in the sand to hide their eggs and their other predators. But gulls do not dig very deep holes.

Other Interesting Information

Gulls are gulls, but some have feet that are different. Some gulls have feet that are webbed. They are difficult to open. So gulls can't swim very well. They are also good at flying. They can fly for hours. They can fly for a week or a month. They can fly for a year. They can fly for a lifetime.

Delivering Content The Code

The Code

The code made of letters and numbers is called DNA. It is the code that tells the body how to grow. The code is made of four letters: A, T, C, and G. These letters are called nucleotides. They are the code that tells the body how to grow. The code is made of four letters: A, T, C, and G. These letters are called nucleotides. They are the code that tells the body how to grow.

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Texts can also play multiple roles...

Gary's Sand Journal

by Gary Larson, Catherine Halverson, Anthony Perry

I can tell that many animals live in the water near the beach. My evidence is the shells and bits of coral.

Notice: What the evidence tells me makes sense. I collected this sand in Hawaii, not the beach in a volcano. I visited the volcano, but I saw lava flow right into the water.

Explanation: My evidence tells me there may be a volcano near this sandy beach. Beach sand usually comes from the rocks. Lava comes from volcanoes.

The sand grains are small. This is evidence of small waves. Small waves can only move small things.

The steep sand grains show that this is new sand. If they had been around long enough to become rounded, they would have flowed out of the volcano and long ago.

Trade Books

Wild Mouse

Where Butterflies Grow

Protecting Primates

What Do You Do With a Tail Like This?

All About Light

Authenticity in Science

Provide Context	➡	Scientists read to situate research
Deliver Content	➡	Scientists read to learn findings
Modeling	➡	Scientists replicate others' procedures and experiments
Supporting Second-hand Investigations	➡	Scientists read and interpret others' data and findings
Supporting Firsthand Investigations	➡	Scientists use reference books

Books!

- What role could the book play?
- How might you use the book in your classroom?

Text and Inquiry Cycle

		Provide context	Deliver content	Model	Support secondhand inquiry	Support firsthand inquiry
1	Explore the topic	X	X	X	X	
2	Ask a question			X	X	
3	Make a hypothesis		X	X		
4	Plan and conduct an investigation			X		X
5	Record and organize data			X		X
6	Analyze results			X	X	
7	Make an explanation based on evidence	X	X	X	X	
8	Ask a new question			X	X	
9	Communicate results			X		

Text and Learning Cycle

	Provide context	Deliver content	Model	Support secondhand inquiry	Support firsthand inquiry
Engage	X		X		
Explore	X	X	X		
Explain	X	X	X	X	X
Extend		X	X	X	X
Evaluate			X	X	X

When should you use books to support firsthand science?

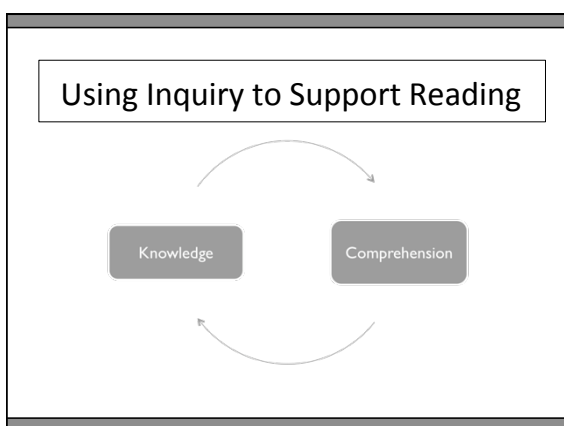
- Before firsthand activities
- During firsthand activities
- After firsthand activities

...depending on what role they play in supporting inquiry

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Arguments for the use of text in inquiry science

- Not everything we want students to know about science can be learned firsthand in classrooms
- Reading is an authentic way that scientists and nonscientists learn about science
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Reading is an Act of Inquiry

- Reading is active
- Many mental processes students use when they inquire —asking questions, making predictions, using what is known to make sense of the unknown, drawing conclusions— are the very same process they use when reading
- Evidence can come from text as well as from direct experience

Inquire Into Text

- Preview the reference book
 - Think about what you already know about the topic
 - Look at the table of contents, headings, bold words, and illustrations
 - Ask yourself what you think you could learn from reading this book
- Pose and record a question
- Use text features to find information related to your question
- Discuss your question, answer, and further questions with someone near you

- What did you find out?
- How might you help students inquire into books?



Text Accessibility



- Repetition of important science vocabulary words
- Limited number of other difficult words (less than 2%)
- Focused on a few central ideas
- Supportive text features
- Classroom tested

Want to learn more?



www.seedsofscience.org
www.delta-education.com

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