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Getting ready for the Next Generation Science Standards

Recommended informational texts for Grades K-3

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The Next Generation Science Standards (NGSS) are upon us. By the fall, teachers in the lower elementary grades will be shaping the teaching of science on the basis of these new standards. In some cases, the shifts will be subtle; in others the NGSS require a whole new approach to teaching science. Perhaps most notable in the new standards is heightened attention to exploration, experimentation and problem solving. The NGSS ask teachers to involve students in hands-on, inquiry-based activities. For example, first graders are to “plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate” and third graders are to “analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.”

As teachers know, the ability of young children to make logical predications or to pose questions is dependent, to some degree, on their background knowledge. The child who has spent time working in a garden and watching the plants grow, flower, and produce fruit, is likely to have some questions about the processes he or she has observed. That child is likely to be able to make hypotheses about how plants grow and the factors that enhance or hamper growth. Hands-on experiences offer rich windows into the world of science.

But what about those topics and concepts that cannot be easily observed or accessed? The NGSS asks teachers to engage their lower elementary grade students in learning across scientific domains (life science; physical science; earth and space science; and engineering, technology, and applications of science). While each standard can be connected to children’s real life experiences, some draw upon less familiar and more abstract concepts. It is in these instances that informational picture books can serve as a rich source of information.

As teachers of young students know, there has been an increased emphasis on the use of informational texts in the lower elementary grades over recent years. Children’s book publishers have responded to the increased attention by publishing greater numbers of informational texts, some of which deal with sophisticated science topics in engaging, age-appropriate ways. In this article, we detail some of the recently published texts we have found to be excellent matches for Next Generation Science Standards in the lower elementary grades. We highlight at least one book for each grade level (K-3) and then provide a more comprehensive list.

The NGSS are explained in a variety of ways, but we find looking at the “performance statement” for each standard to be a useful place to begin. Once we understand what children are expected to be able to do, then we take a look at what they are expected to know that will support them as they attempt to do.

Texts to support kindergarten standards

Among the kindergarten standards is the performance statement requiring that students “plan and conduct an investigation to compare the effects of different strengths or different directions of pushes or pulls on the motion of an object.” The NGSS delineates three disciplinary core ideas to support this standard:

PS2.A: Forces and Motion

• Pushes and pulls can have different strengths and directions.
• Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

PS2.B: Types of Interactions

• When objects touch or collide, they push on one another and can change motion.

PS3.C: Relationship Between Energy and Forces

• A bigger push or pull makes things speed up or slow down more quickly.

In our search for informational texts that can be used to support children’s developing understanding of these ideas, we discovered *Oscar and the Cricket: A Book About Moving and Rolling* from the Start with Science series written by Geoff Waring and published by Candlewick Press. Oscar, a cat, and his cricket friend engage in play that involves pushing and pulling a number of objects. This book belongs to the narrative nonfiction genre, providing scientific information through the story of Oscar and the cricket’s antics.

This is a book that lends itself to a read aloud, followed by opportunities for kindergarteners to try out some of the pushing and pulling scenarios introduced in the story. Kindergarten teachers can help their students record the results of their experiments with various objects and different kinds of pushes and pulls. Soon the teacher will be able to invite students to suggest new push/pull investigations. In addition to being highly excited and engaged in these activities, the kindergarteners will build background knowledge about this foundational aspect of physical science and will be able to predict the results of their experiments.

Texts to support first-grade standards

For first grade, we have chosen to highlight the life science standard that asks teachers to prepare students to “read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.” The disciplinary core idea that underscores
this performance expectation is:

**LSi.B: Growth and Development of Organisms**

- Adult plants and animals can have young.
  In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.

To support children’s developing awareness of these ideas, we recommend the beautifully illustrated *Born in the Wild: Baby Mammals and Their Parents*, published in 2014 by Roaring Book Press. In each segment of the book, Lita Judge, the book’s author and illustrator, highlights three animals that offer evidence for different ways that babies and their parents behave, most directly connected to survival.

For example, one of the sections of the book is given the heading “The baby needs protection.” Then, the two-page spread that follows highlights three mammals: white-tailed deer, pandas, and musk oxen, beginning, “Mammals are born small and defenseless—they need to be kept safe from danger.” The example of the white-tailed deer reads, “In his first few days, a white-tailed deer fawn is too wobbly and frail to run, so he hides by staying perfectly still. His mother comes back to nurse him occasionally, but most of the time she says away so hungry predators don’t find him.”

First-grade teachers can read *Born in the Wild* aloud over several sittings and guide the class in a discussion about the behaviors that keep the baby animals alive. Together the teacher and the students will create a chart to record these ideas, providing guided practice that will enable students to begin to use texts to learn about additional animals when working away from the teacher.

Practice of this standard with less teacher support might happen at a classroom “Research Center” full of easier-to-read texts (e.g., *Ranger Rick, Jr.* magazines or leveled, nonfiction texts about animals). Students might work together at the center to add new information to the chart started during the whole class discussion of *Born in the Wild*.

**Texts to support second-grade standards**

For second grade, the NGSS include several standards in the category of earth and space systems. Here we highlight the performance standard, “Obtain information to identify where water is found on earth and that it can be solid or liquid.” The disciplinary core idea that underscores this standard is:

**ESS2.C: The Roles of Water in Earth’s Surface Processes**

- Water is found in the ocean, rivers, lakes and ponds. Water exists as solid ice and in liquid form.

In order to achieve this performance standard, students must engage in the following scientific practice for “obtaining, evaluating, and communicating information”:

- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) and other media that will be useful in answering a scientific question.

To support students as they develop an understanding of water’s presence across the earth and to provide them with opportunities to use informational texts to obtain information, we highlight two texts.

The first, *Water Is Water: A Book About the Water Cycle*, written by Miranda Paul and illustrated by Jason Chin, was published in 2015 by Roaring Book Press. Beautifully illustrated, the book is written in poetic verse, but showcases many aspects of the water cycle. The words including, “Clouds are clouds unless...they form low. Misty, twisty. Where is the town? Fog is fog unless...” lead the reader from water leaving a faucet, to steam, to clouds and rain and snow, all the way to the water absorbed by tree roots and contained within an apple. We recommend using *Water is Water* to introduce various aspect of the water cycle, allowing students to think about the ways in which they’ve experienced the water cycle in their own lives and to introduce them to phenomena they have not yet observed.

The second text we recommend is an example of the kind of text typically imagined when nonfiction texts are discussed. *Water*, a National Geographic Kids expository text, written by Melissa Stewart, was published in 2014. It contains many of the features expected of a nonfiction expository text including a table of contents, diagrams, maps, and photographs, a glossary and an index. The book begins with a section titled “A Watery World” that explains that water covers three-fourths of the earth’s surface; many of the other sections of the book are dedicated to information about the various locations and forms of water on earth, making it an obvious choice for supporting the target disciplinary core idea. Likewise, the text offers teachers many opportunities to support student use of various features of expository text to acquire information. Lessons on how to read the text and incorporate information provided by maps, diagrams, and photographs and described in captions could accompany this text.

**Texts to support third-grade standards**

Among the third grade life science standards is the expectation that “students will
be able to analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms." The NGSS delineates two disciplinary core ideas that will enable students to achieve this goal:

**LS3.A: Inheritance of Traits**
- Many characteristics of organisms are inherited from their parents.

**LS3.B: Variation of Traits**
- Different organisms vary in how they look and function because they have different inherited information.

In our search for books to support students’ development of an understanding of heredity, we found a book that we expect third graders will find highly relatable and intriguing. *Inheritance of Traits: Why Is My Dog Bigger Than Your Dog?* written by Jen Green was published by Raintree Books in 2014 as part of their “Show Me Science” series. This book explains the role of genes in the inheritance of traits such as ear length and hair color and type among dogs, cats and ponies.

A section about greyhounds and how they were bred for their speed states, “For centuries, breeders selected animals without understanding how inheritance worked. Now we know that features pass from parents to their young through genes, which are found inside cells.” The book also discusses the role of parents in heredity when answering the question, “If the two dogs come from the same litter, and inherited half their genes from each parent, why don’t they look exactly the same?”

Once they understand the basics of heredity, third graders can use this book and others to make a t-chart of animals and the traits that they inherit from their parents. In the case of dogs, information about speed, fur color, sniffing ability, and agility are among the traits discussed. This data can then be put into paragraph form and shared with the class.

We are enthusiastic about the possibilities these texts offer to students and teachers engaged with the learning outlined by the Next Generation Science Standards. See Page 28 for additional texts to use with your students.

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*Photos are from Sarah Anderson’s 3rd grade class in Metuchen.*

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Amazing informational texts

As we searched for informational texts that teachers in the lower elementary grades can use to support their students as they learn about and experiment with the scientific concepts outlined by the Next Generation Science Standards, we found a range of interesting, well-written texts accompanied by beautiful illustrations and photographs.

**Kindergarten**

**Weather:**
- National Geographic Readers: Weather by Kristin Baird Rattini
- Hurricane Watch (Let’s-Read-and-Find-Out Science, Stage 2) by Melissa Stewart

**Animals and plants:**
- Beavers by Gail Gibbons
- A Nest Is Noisy by Dianna Hutts Aston
- Woodpecker Wham! by April Pulley Sayre
- National Geographic Readers: Monkeys by Anne Schreiber
- National Geographic Readers: Weird Sea Creatures by Laura Marsh

**Push and pull:**
- Oscar and the Cricket: A Book About Moving and Rolling (Start with Science) by Geoff Waring

**First grade**

**Animals and plants (features):**
- My Little Book of Ocean Life by Camilla de la Bédoyère
- A Bird Is a Bird by Lizzy Rockwell
- Best Foot Forward by Ingo Arndt
- Feathers: Not Just for Flying by Melissa Stewart
- Animal Faces by Penelope Arlon and Tory Gordon-Harris

**Animals and plants (babies):**
- Born in the Wild: Baby Mammals and Their Parents by Lita Judge
- Ferdinand Fox’s First Summer by Mary Holland

**Sound and light waves:**
- What Are Sound Waves? (Light & Sound Waves Close-Up) by Robin Johnson

**Sun, moon, and stars:**
- The Sun (revised edition, 2015) by Seymour Simon

**Second grade**

**Properties of matter (physical/chemical):**
- Changing Matter (Science Readers) by Karen Larson

**Animals and Plants:**
- Seeds and Fruits (Plant Parts) by Melanie Waldron
- Flip, Float, Fly: Seeds on the Move by JoAnn Early Macken and Pam Paparone
- Up in the Garden and Down in the Dirt by Kate Messner

**Rocks, water, and erosion of earth:**
- Water Is Water: A Book About the Water Cycle by Miranda Paul
- National Geographic Readers: Water by Melissa Stewart

**Third grade**

**Interdependent Relationships in Ecosystems:**
- The Great Monkey Rescue by Sandra Markle
- Dirty Rats by Darrin Lunde

**Inheritance and Variation of Traits:**
- Inheritance of Traits: Why Is My Dog Bigger Than Your Dog? by Jen Green
- Gregor Mendel: The Friar Who Grew Peas by Cheryl Bardoe

**Weather and Climate:**
- Hurricanes! by Gail Gibbons
- When the Sky Breaks: Hurricanes, Tornadoes, and the Worst Weather in the World by Simon Winchester