Why Read Picture Books in Science Class?

Think about a book you loved as a child. Maybe you remember the zany characters and rhyming text of Dr. Seuss classics such as *Green Eggs and Ham* or *The Lorax.* Perhaps you enjoyed the page-turning suspense of *The Monster at the End of This Book* or the fascinating facts found in Joanna Cole's *Dinosaur Story.* You may have seen a little of yourself in *Where the Wild Things Are, Curious George,* or *Madeline.* Maybe your imagination was stirred by the detailed illustrations in *Jumanji* or the stunning photographs in Seymour Simon's *The Moon.* You probably remember the warm, cozy feeling of having a treasured book such as *The Snowy Day* or *Goodnight Moon* being read to you by a parent or grandparent. But chances are your favorite book as a child was *not* your fourth-grade science textbook! The format of picture books offers certain unique advantages over textbooks and chapter books for engaging students in a science lesson. More often than other books, fiction and nonfiction picture books stimulate students on both the emotional and intellectual levels. They are appealing and memorable because children readily connect with the imaginative illustrations, vivid photographs, and engaging storylines, as well as the experiences and adventures of characters, the fascinating information that supports them in their quest for knowledge, and the warm emotions that surround the reading experience.

What characterizes a picture book? We like what *Beginning Reading and Writing* says: "Picture books are unique to children's literature as they are defined by format rather

than content. That is, they are books in which the illustrations are of equal importance as or more important than the text in the creation of meaning" (Strickland and Morrow 2000). Because picture books are more likely to hold children's attention, they lend themselves to reading comprehension strategy instruction and to engaging students within an inquiry-based cycle of science instruction. "Picture books, both fiction and nonfiction, are more likely to hold our attention and engage us than reading dry, formulaic text. ... Engagement leads to remembering what is read, acquiring knowledge and enhancing understanding" (Harvey and Goudvis 2000). We wrote *Picture-Perfect Science Lessons* so teachers can take advantage of the positive features of children's picture books by supplementing the traditional science textbook with a wide variety of high-quality fiction and nonfiction science-related picture books.

The Research

1. Context for Concepts

Literature gives students a context for the concepts they are exploring in the science classroom. Children's picture books, a branch of literature, have interesting storylines that can help students understand and remember concepts better than they would by using textbooks alone, which tend to present science as lists of facts to be memorized (Butzow and Butzow 2000). In addition, the colorful pictures and graphics in picture books are superior to many texts for explaining abstract ideas (Kralina 1993). As more and more content is packed into the school day, and higher expectations are placed on student performance, it is critical for teachers to cover more in the same amount of time. Integrating curriculum can help accomplish this. The wide array of high-quality children's literature available today can help you model reading comprehension strategies while teaching science content in a meaningful context.

2. More Depth of Coverage

Science textbooks can be overwhelming for many children, especially those who have reading problems. They often contain unfamiliar vocabulary and tend to cover a broad range of topics (Casteel and Isom 1994; Short and Armstrong 1993; Tyson and Woodward 1989). However, fiction and nonfiction picture books tend to focus on fewer topics and give more in-depth coverage of the concepts. It can be useful to pair an engaging fiction book with a nonfiction book to round out the science content being presented.

For example, the Chapter 13 lesson "Oil Spill!" features both *Prince William*, a fictionalized account of a young girl's experience rescuing an oil-covered baby seal, and *Oil Spill!*, a nonfiction book detailing causes and effects of oil spills. The emotion-engaging storyline and the realistic characters in *Prince William* hook the reader, and the book *Oil Spill!* presents facts and background information. Together they offer a balanced, in-depth look at how oil spills affect the environment.

3. Improved Reading and Science Skills

Research by Morrow, Pressley, Smith, and Smith (1997) on using children's literature and literacy instruction in the science program indicated gains in science as well as literacy. Romance and Vitale (1992) found significant improvement in both science and reading scores of fourth graders when the regular basal reading program was replaced with reading in science that correlated with the science curriculum. They also found an improvement in students' attitudes toward the study of science.

4. Opportunities to Correct Science Misconceptions

Students often have strongly held misconceptions about science that can interfere with their learning. "Misconceptions, in the field of science education, are preconceived ideas that

differ from those currently accepted by the scientific community" (Colburn 2003). Children's picture books, reinforced with hands-on inquiries, can help students correct their misconceptions. Repetition of the correct concept by reading several books, doing a number of experiments, and listening to scientists invited to the classroom can facilitate a conceptual change in children (Miller, Steiner, and Larson 1996).

But teachers must be aware that scientific misconceptions can be inherent in picture books. Although many errors are explicit, some of the misinformation is more implicit or may be inferred from text and illustrations (Rice 2002). This problem is more likely to occur within fictionalized material. Mayer's (1995) study demonstrates that when both inaccuracies and science facts are presented in the same book, children do not necessarily remember the correct information.

Scientific inaccuracies in picture books can be useful for teaching. Research shows that errors in picture books, whether identified by the teacher or the students, can be used to help children learn to question the accuracy of what they read by comparing their own observations to the science presented in the books (Martin 1997). Scientifically inaccurate children's books can be helpful when students analyze inaccurate text or pictures after they have gained understanding of the correct scientific concepts through inquiry experiences.

For example, in "The Changing Moon" lesson, Chapter 17, students analyze the inaccurate moon phases in Eric Carle's *Papa, Please Get the Moon for Me* and then correct them through their own illustrations of the story. This process takes students to a higher level of thinking as they use their knowledge to evaluate and correct the misinformation in the picture book.

Use With Upper Elementary Students

Picture-Perfect Science Lessons is designed for students in grades 3 through 6. Although picture books are more commonly used with younger children, we have good reasons to recommend using them with upper elementary students. In *Strategies That Work* (2000), reading experts Harvey and Goudvis maintain that "the power of well-written picture books cannot be overestimated... picture books lend themselves to comprehension strategy instruction at every grade level." The benefits of using picture books to teach science and reading strategies are not reserved for younger children. We have found them effective for engaging students, for guiding scientific inquiry, and for teaching comprehension strategies to students in kindergarten through eighth grade. We believe that the wide range of topics, ideas, and genres found in picture books reaches all readers, regardless of their ages, grades, reading levels, or prior experiences.

Selection of Books

Each lesson in *Picture-Perfect Science Lessons* focuses on one or more of the National Science Education Standards. We selected one to three fiction and/or nonfiction children's picture books that closely relate to the Standards. An annotated "More Books to Read" section is provided at the end of each lesson. If you would like to select more children's literature to use in your science classroom, try the Outstanding Science Trade Books for Students K–12 listing, a cooperative project between the National Science Teachers Association (NSTA) and the Children's Book Council (CBC). The books are selected by a book review panel appointed by the NSTA and assembled in cooperation with the CBC. Each year a new list is featured in the March issue of NSTA's elementary school teacher journal, *Science and Children.* See *www.nsta.org/ostbc* for archived lists.

When you select children's picture books for science instruction, you should consult with a knowledgeable colleague who can help you check them for errors or misinformation. You might talk with a high school science teacher, a

retired science teacher, or a university professor. To make sure the books are developmentally appropriate or lend themselves to a particular reading strategy you want to model, you could consult with a language arts specialist.

Finding the *Picture-Perfect* Books

Each activity chapter includes a "Featured Picture Books" section with titles, author names, summaries, and other publication details. The years and publisher names listed are for the most recent editions available—paperback, wherever possible—as of the printing of *Picture-Perfect Science Lessons, Expanded 2nd Edition*.

All of the trade books featured in *Picture-Perfect Science Lessons* are currently in print and can be found at your local bookstore or online retailer. Many of the picture books—including previously hard-to-find and out-of-print books such as *Bubble, Bubble*; *That Magnetic Dog;* and *Rice Is Life*—are available at *www.nsta.org/store*. There you can also buy *all* of the *Picture-Perfect Science Lesson* books in one handy collection at a reduced cost.

Considering Genre

Considering genre when you determine how to use a particular picture book within a science lesson is important. Donovan and Smolkin (2002) identify four different genres frequently recommended for teachers to use in their science instruction: story, nonnarrative information, narrative information, and dual purpose. *Picture-Perfect Science Lessons* identifies the genre of each featured book at the beginning of each lesson. Summaries of the four genres, a representative picture book for each genre, and suggestions for using each genre within the BSCS 5E learning cycle we use follow. (The science learning cycle known as the BSCS 5E Model is described in detail in Chapter 4.)

Storybooks

Storybooks center on specific characters who work to resolve a conflict or problem. The major purpose of stories is to entertain, not to present factual information. The vocabulary is typically commonsense, everyday language. An engaging storybook can spark interest in a science topic and move students toward informational texts to answer questions inspired by the story. For example, "Earthlets," Chapter 6, uses the storybook *Dr. Xargle's Book of Earthlets* to hook learners and engage them in an inquiry about mystery samples from Planet Earth.

Scientific concepts in stories are often implicit, so teachers must make the concepts explicit to students. As we mentioned, be aware that storybooks often contain scientific errors, either explicit or implied by text or illustrations. Storybooks with scientific errors should not be used in the introduction of a topic, but may be used later in the lesson to teach students how to identify and correct the misconceptions. For example, "The Changing Moon," Chapter 17, features Eric Carle's *Papa, Please Get the Moon for Me*, a storybook that contains many scientific inaccuracies. This book would not be appropriate for introducing how the Moon seems to change shape, but it can be a powerful vehicle for assessing the ability of learners to analyze the scientific accuracy of a text.

Nonnarrative Information Books

Nonnarrative information books are factual texts that introduce a topic, describe the attributes of the topic, or describe typical events that occur. The focus of these texts is on the subject matter, not specific characters. The vocabulary is typically technical. Readers can enter the text at any point in the book. Many contain features found in nonfiction such as a table of contents, bold-print vocabulary words, a glossary, and an index. Young children tend to be less familiar with this genre and need many opportunities to experience this type of text. Using nonnarrative information books helps

students become familiar with the structure of textbooks, as well as "real-world" reading, which is primarily expository. Teachers may want to read only those sections that provide the concepts and facts needed to meet particular science objectives.

We wrote the articles included in some of the lessons (see Chapters 8, 11, 14, and 16) in nonnarrative information style to give students more opportunity to practice reading this type of text. For example, "Close Encounters of the Symbiotic Kind," Chapter 11, includes an article written in an expository style that shows key words in bold print. Another example of nonnarrative information writing is the book *Rice,* which contains nonfiction text features such as a table of contents, bold-print words, diagrams, a glossary, and an index. *Rice* is featured in "Rice Is Life," Chapter 8. The appropriate placement of nonnarrative information text in a science learning cycle is after students have had the opportunity to explore concepts through hands-on activities. At that point, students are engaged in the topic and are motivated to read the nonnarrative informational text to learn more.

Narrative Information Books

Narrative information books, sometimes referred to as "hybrid books," provide an engaging format for factual information. They communicate a sequence of factual events over time and sometimes recount the events of a specific case to generalize to all cases. When using these books within science instruction, establish a purpose for reading so that students focus on the science content rather than the storyline. In some cases, teachers may want to read the book one time through for the aesthetic components of the book and a second time for specific science content. *Butternut Hollow Pond,* an example of a narrative information text, is used in "Mystery Pellets," Chapter 10. This narrative presents the dynamics of survival and competition in a pond ecosystem and contains factual information about a pond food web. The narrative information genre can be used at any point within a science learning cycle. This genre can be both engaging and informative.

Dual-Purpose Books

Dual-purpose books are intended to serve two purposes: present a story and provide facts. They employ a format that allows readers to use the book like a storybook or to use it like a nonnarrative information book. Sometimes information can be found in the running text, but more frequently it appears in insets and diagrams. Readers can enter on any page to access specific facts, or they can read it through as a story. You can use the story component of a dual-purpose book to engage the reader at the beginning of the science learning cycle. For example, Chapter 8 features the book *Rice Is Life,* which is used to engage the students in an investigation about rice.

Dual-purpose books typically have little science content within the story. Most of the informational ideas are found in the insets and diagrams. If the insets and diagrams are read, discussed, explained, and related to the story, these books can be very useful in helping students refine concepts and acquire scientific vocabulary *after* they have had opportunities for hands-on exploration. *White Owl, Barn Owl* is a dual-purpose book used in Chapter 10, "Mystery Pellets."Although the story part is about a girl and her grandfather's search for an owl, the insets can be read to give students factual information about the characteristics and life cycles of barn owls.

Using Fiction and Nonfiction Texts

As we mentioned previously, pairing fiction and nonfiction books in read alouds to round out the science content being presented is effective. Because fiction books tend to be very engaging for students, they can be used to hook students

at the beginning of a science lesson. But most of the reading people do in everyday life is nonfiction. We are immersed in informational text every day, and we must be able to comprehend it to be successful in school, at work, and in society. Nonfiction books and other informational text such as articles should be used frequently in the elementary classroom. They often include text structures that differ from stories, and the opportunity to experience these structures in read alouds can strengthen students' abilities to read and understand informational text. Duke (2004) recommends four strategies to help teachers improve students' comprehension of informational text. Teachers should

- increase students' access to informational text;
- increase the time they spend working with informational text;
- teach comprehension strategies through direct instruction; and
- create opportunities for students to use informational text for authentic purposes.

Picture-Perfect Science Lessons addresses these recommendations in several ways. The lessons expose students to a variety of nonfiction picture books and articles on science topics, thereby increasing access to informational text. The lessons explain how word sorts, anticipation guides, pairs reading, and the use of nonfiction features all help improve students' comprehension of the informational text by increasing the time they spend working with it. Each lesson also includes instructions for explicitly teaching comprehension strategies within the learning cycle. The inquiry-based lessons provide an authentic purpose for reading informational text, as students are motivated to read or listen to find the answers to questions generated within the inquiry activities.

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