

## Hiding in Plain Sight

### How to identify and use trade books to support the 5E Instructional Model

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Using trade books to support science instruction is a time-honored tradition. A well-chosen book can generate interest in a science topic, present a problem, challenge misconceptions, and explain content. The Children's Book Council and NSTA review hundreds of books yearly and publish their recommendations as the Outstanding Science Trade Books for Students K–12 list (see Internet Resources). In addition, the *Science and Children* column Teaching Through Trade Books recommends two books per issue. These reliable resources often include ideas for using trade books to support science instruction.

However, your school and classroom library collections are likely filled with other high-quality trade books not on these lists. These books are hiding in plain sight, just waiting to enrich your science teaching. Yet, deciding the best way to integrate these books in inquiry lessons can also be challenging. Using the right book in the wrong place in a lesson can prematurely shut down discussions, rob students of opportunities to make sense of their own observations, or reinforce common misconceptions. The 5E Instructional Model (Bybee 2014) structures and supports hands-on scientific inquiry across five phases: Engage, Explore, Explain, Elaborate, and Evaluate. Considering this, we have uncovered parallel trade book features that can help you decide in which phase to use your favorite trade books (Table 1). In this article, we briefly review each phase of the 5E



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A read-aloud captures students' attention.

Instructional Model and explain how we select trade books and align literacy strategies to enhance each phase. In addition, we highlight some of our favorite books for each phase (Table 2, p. 82).

You may notice that the lexile reading levels for a book may not always match the grade level of the *Next Generation Science Standards* (NGSS Lead States 2013) that we suggest for that book. Because many of these books are intended to be read aloud to the whole class, it is acceptable for the lexile reading levels to be higher than the grade level. Read-alouds encourage students to think about and beyond the text. Similarly, the illustrations, problems, and patterns within books that have lower lexile

reading levels can often be used with older students to deepen their understanding of science concepts. The focus here is not to teach students how to read with these books but rather to use these books to help teach science concepts. However, “reading to teach” in science can support “teaching to read” in English language arts, as many aspects of scientific practice parallel metacognitive reading strategies, including making observations, predicting, inferring, comparing and contrasting, classifying, summarizing data, and recognizing cause-and-effect relationships (Fountas and Pinnell 2006; NGSS Lead States 2013).

### ENGAGE

Engage activities are brief. They are related to the science content included in state or national standards but do not explicitly teach content. Rather they capture students' attention, stimulate thinking, help students access and activate prior knowledge, or expose misconceptions (Bybee 2014).

Trade books that ask questions, define problems, activate prior knowledge, prompt conversations, or chronicle current events are good choices for the Engage phase. Poetry books and books containing riddles are also appropriate. Books with clear, captivating pictures are excellent choices for working with all students; however, they can be particularly useful for supporting English language learners. Engage activities activate prior knowledge and should not include trade books that directly teach

TABLE 1

## Trade book features and literacy strategies aligned to the 5E Instructional Model.

5E PHASE	PHASE SUMMARY (BYBEE 2014)	TRADE BOOK FEATURES	LITERACY STRATEGIES
Engage	Brief activity related to the content or practices included in the lesson objective that captures students' attention and interest	<ul style="list-style-type: none"> <li>• Launches a story of scientific discovery</li> <li>• Introduces a problem, question, event, or riddle</li> <li>• Presents a captivating picture or poem that elicits prior knowledge or sparks discussion</li> </ul>	<ul style="list-style-type: none"> <li>• Picture Walk</li> <li>• Book Talk</li> <li>• First Line</li> <li>• Read-Aloud</li> </ul>
Explore	Concrete, hands-on experiences that provide time for students to formulate explanations, investigate phenomena, observe patterns, and clarify understanding	<ul style="list-style-type: none"> <li>• Structures opportunities for parallel reading and hands-on observation</li> <li>• Provides clear instructions for science experiments and activities, including safety tips.</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive Read Aloud—pause at predetermined points and complete a hands-on activity (repeat)</li> </ul>
Explain	Synthesis of students' explanations and experiences with direct-instruction of key scientific or technological concepts and academic vocabulary	<ul style="list-style-type: none"> <li>• Describes or explains a scientific concept</li> <li>• Uses academic vocabulary and contains accurate illustrations</li> <li>• Supports interpretation of observations, as with field guides</li> <li>• Typically nonfiction</li> </ul>	<ul style="list-style-type: none"> <li>• Informational Text</li> <li>• Interactive Read-Aloud—pause at predetermined points and discuss key concepts related to Explore (repeat)</li> </ul>
Elaborate	Learning experiences that extend, expand, and enrich the concepts and practices developed in the prior phases and facilitate transfer to related, but new, real-world situations	<ul style="list-style-type: none"> <li>• Applies a scientific concept in a real-world setting</li> <li>• Presents a challenge requiring students to apply a scientific concept or ability</li> <li>• Biographies</li> </ul>	<ul style="list-style-type: none"> <li>• Claim, Evidence, and Reasoning statements</li> <li>• Open Mind Portraits</li> <li>• Readers Theater</li> </ul>
Evaluate	Assessment of student knowledge of science concepts and practices included in the lesson objective	<ul style="list-style-type: none"> <li>• Contains errors, misconceptions, or exaggerations in the text or illustrations</li> <li>• Reviews patterns across a scientific concept</li> <li>• Includes breaks between the questions posed in the text and the answers provided</li> </ul>	<ul style="list-style-type: none"> <li>• Students identify and correct errors or exaggerations in the text and/or illustrations</li> <li>• Two truths and a lie</li> <li>• Interactive Read-Aloud—pause at predetermined points and have students complete an idea, answer questions, or make predictions (repeat)</li> </ul>

concepts that will later be discovered in Explore and discussed in Explain. Once you have selected a trade book for use in Engage, we recommend using a picture walk, a book talk, the first line pre-reading activity, or a read-aloud to present it to students.

A *picture walk* is a teacher-guided pre-reading activity. Before reading a book to the class, the teacher should allow students to “take a walk” through the book while displaying illustrations in order to create interest in the topic and activate prior knowledge without explicitly teaching any content. Teachers may also encourage students to make predictions and develop their own meaning (Richardson 2016) about the key details of each picture via observations and infer-

ences. (See Table 2 for examples of trade books aligned to each literacy strategy).

A *book talk* is a brief overview or introduction of a book and generally motivates students to want to learn more about the content included in the book. Teachers can use short excerpts from the book to probe students’ initial understanding of science content and/or introduce Explore activities.

*First Line* is a literacy strategy used to help students focus on the first line, sentence, or stanza included in a story, book, or poem. After listening to or reading the first line, students make predictions about the content covered in the story, book, or poem. Then, they share their predictions in

small groups or with the whole class. Teachers may read the rest of the book to the class during Engage or return to the book later in the lesson to test and revise student predictions.

Read-alouds are a traditional classroom routine. Books that are selected for use in Engage should capture students’ attention, activate prior knowledge, raise questions, and motivate the students to learn more about the topic without directly teaching concepts that will be discovered later as students explore.

**EXPLORE**

The Explore phase gives students an opportunity to participate in hands-on inquiry through science investigations and lab experiences. As stu-

TABLE 2

**Trade book examples aligned to the 5E instructional model.**

5E PHASE	LITERACY STRATEGY	TRADE BOOK EXAMPLE
<b>Engage</b>	Picture Walk	<i>I See a Kookaburra</i> , by Steve Jenkins and Robin Page, is designed to support a picture walk. The authors creatively present six habitats from around the world and introduce a few animals from each habitat. The animals are camouflaged in the introductory pages so students can play hide-and-seek or I Spy to locate various animals hidden in the illustrations. This book may be used to introduce biodiversity in ecosystems (2-LS4-1; 3-LS4-4).
	Book Talk	<i>Not a Box</i> , by Antoinette Portis, imaginatively explores how children use boxes during play. This book talk can launch an investigation of how a small set of pieces can be disassembled and made into new objects (2-PS1-3).
	First Line	<i>Pass the Energy Please</i> , by Barbara Shaw McKinney, is a rhyming story about the flow of energy in food chains. This book introduces the role of plants (producers) in food chains and provides a creative way to tap into what students know or think they know about the flow of energy in chemical processes and everyday life (5-PS3-1).
	Read Aloud	<i>Roly Poly Pangolin</i> , by Anna Dewdney, is a fun story about an animal with which many students may be unfamiliar, the pangolin. Student curiosity for learning more about the pangolin is sure to grow after reading this story (1-LS1-1; 4-LS1-1).

dents investigate natural phenomena, they construct models, collect and analyze data, observe patterns, as well as make, test, and revise predictions (Bybee 2014).

Trade books that structure opportunities for parallel reading and hands-on observations or that provide clear instructions and/or safety tips for science experiments and activities are appropriate for use during the Explore phase. Explore activities are designed to provide students with

inquiry experiences that they can access later in the 5E instructional sequence. Books or sections of books that directly teach science content should be avoided.

Interactive read-alouds are a great way to structure parallel reading and hands-on observations or experimentation. A read-aloud becomes interactive when teachers provide parallel opportunities for students to actively explore concepts presented in the book. This is accomplished

when teachers pause at predetermined points in the text so students can complete a hands-on science activity. This cycle of “reading then exploring” is repeated as the book introduces new questions or concepts. When selecting books for interactive read-alouds, teachers should consider how the genre, text structure, science content, themes and ideas, literary features, sentence complexity, vocabulary, and illustrations compel further exploration (Pinnell and Fountas 2011).

TABLE 2

Trade book examples aligned to the 5E instructional model.

5E PHASE	LITERACY STRATEGY	TRADE BOOK EXAMPLE
<b>Explore</b>	Interactive Read-Aloud (pause for parallel investigation)	<i>Up in the Garden and Down in the Dirt</i> , by Kate Messner, can be used to help students gain a better understanding of how some plants and animals use their external parts to survive, grow, and meet their needs. The story takes place in a garden across the seasons of a year. The dialogue included throughout the story mentions a variety of animals and plants that can be found in a typical garden. As part of the Explore, students create models to demonstrate how animals interact with their environment. (1-LS1-1; 3-LS4-3)
	Interactive Read-Aloud (pause for parallel investigation)	<i>Dear Mr. Henshaw</i> , by Beverly Cleary, is composed of letters and diary entries written by the main character Leigh Botts. Diary entries track a mysterious lunch thief and Leigh’s use of wire, batteries, a switch, and a doorbell to make a burglar alarm for his lunch box. Like Leigh, students can use wire, batteries, a switch, and a buzzer to build an alarm for a closed container during Explore (4-PS3-2).
	Interactive Read-Aloud (pause for parallel investigation)	<i>Marta’s Magnets</i> , by Wendy Pfeffer, is a story of friendship that includes scientific ideas about magnetism. When a friend accidentally drops her house keys down a sidewalk grate, Marta tries to retrieve the keys using string and a magnet. Pause the read-aloud between Marta’s attempts to retrieve the keys so students can conduct parallel investigations and brainstorm redesigns. (3-PS2-3; 3-PS2-4).
	Interactive Read-Aloud (pause for parallel investigation)	<i>What’s the Matter in Mr. Whiskers’ Room?</i> , by Michael Elsohn Ross, includes a description of seven science stations that Mr. Whisker’s students use to explore properties of matter. After reading a section that describes a station, pause while students complete a parallel investigation (2-PS1-1).

**EXPLAIN**

In the Explain phase, teachers use questions to guide students through an analysis of their exploration experience to construct, clarify, and modify student understanding. In addition, teachers build on student explanations and experience by explicitly teaching scientific or technological concepts as well as academic vocabulary (Bybee 2014). This is a great time for teachers to clear up any persistent student misconceptions related to the science concept being studied.

Books that describe or explain scientific concepts, introduce and use academic vocabulary, contain accurate illustrations, and support students' interpretation of observations work well in this phase. High-quality nonfiction, informational trade books, field guides, and scientifically accurate fiction books can all support Explain activities. Selected books should tightly align with the state or national science standards and objectives of the lesson. Interactive read-alouds and scaffolded individual or

small-group reading of informational texts pair well with Explain activities.

Interactive read-alouds structure explanatory discussions when teachers read a passage and pause at predetermined points to ask questions that promote discussion of what students experienced in Explore.

Graphic organizers can be used to help students uncover key scientific concepts from expository text. These organizers can highlight descriptive features of a phenomenon, comparisons and contrasts, sequential events,

TABLE 2 (CONTINUED)

**Trade book examples aligned to the 5E instructional model.**

5E PHASE	LITERACY STRATEGY	TRADE BOOK EXAMPLE
<b>Explain</b>	Interactive Read-Aloud (pause for questions & discussion)	<i>Cracking Up: A Story About Erosion</i> , by Jacqui Bailey, uses a series of illustrations to depict the process of erosion and how water, wind, and ice weather the surface of the Earth. Students can synthesize their own data by modeling these processes, then matching their results to the detailed descriptions in this story to develop rich explanations of how the Earth's surface is constantly changing (2-ESS1-1).
	Interactive Read-Aloud (pause for questions & discussion)	<i>Are You My Mother?</i> , by P.D. Eastman, follows a baby bird on his quest to find his mother. During the read aloud, pause when the baby bird meets the kitten, the hen, the dog, the cow, the car, the boat, the plane, the snort, and ask, "Is this the baby bird's mother?" "Why not?" (1-LS3-1).
	Graphic Organizers With Informational Text	<i>What Do You Do With a Tail Like This?</i> , by Steve Jenkins and Robin Page, takes students on an exploratory journey of animal adaptations, including features such as noses, ears, tails, eyes, mouths, and feet. Informational text at the end of the book provides additional details about each adaptation. Students could use this informational text to add to a Word Wall of animal adaptations (1-LS1-1; 4-LS1-1).
	Graphic Organizers With Informational Text	<i>What if There Were no Gray Wolves?</i> , by Suzanne Slade, explores what would happen to temperate forest ecosystems if gray wolves, a keystone species, became extinct. The importance of biodiversity is powerfully addressed as plants and animals negatively affected by the loss of gray wolves are included in illustrations as black voids. Students can create a concept map to track changes in the ecosystem and then use informational text to explain the changes (5-LS2-1).

cause-and-effect relationships, or problems and solutions. Students can then use these graphic organizers to build interactive Word Walls that synthesize their data from the Explore phase with their new understandings from the readings. When selecting books with informational text, it is important to differentiate the text according to each student's individual reading level. Consider assigning different books or different passages of text to different students or providing English language learners with text in their first language.

### ELABORATE

Elaboration gives students an opportunity to use concepts and abilities

developed in prior phases to extend, expand, and enrich their understanding. Real-world connections, transfer of learning, and application of content are key features of Elaborate (Bybee 2014).

Trade books that showcase application of scientific content in real-world settings and support the transfer of knowledge are excellent choices. Books that present a challenge that motivates students to use science content to solve a problem are also appropriate. In addition, biographies that showcase science as a human endeavor and help students understand that science is dynamic work well too. Framing scientific arguments with claims, evidence and

reasoning statements, creating open mind portraits, and preparing and performing readers theaters give students multiple opportunities to apply scientific understanding.

Claims, evidence, and reasoning (CER) statements frame scientific arguments. The *Next Generation Science Standards* suggest that inquiry includes planning and carrying out investigations so students can “generate data to provide evidence to support claims they make. Data aren't evidence until used in the process of supporting a claim” (NGSS Lead States 2013).

Students create open mind portraits after reading biographies of scientists. Students sketch a head and

TABLE 2

#### Trade book examples aligned to the 5E instructional model.

5E PHASE	LITERACY STRATEGY	TRADE BOOK EXAMPLE
<b>Elaborate</b>	Claim, Evidence, & Reasoning Statements	<i>Summer Birds: The Butterflies of Maria Merian</i> , by Margarita Engle, tells the true story of a 17th-century girl who challenged ancient theories about animals. Maria claimed that frogs and insects had life cycles, that they did not spring from mud, and were not evil creatures. She supported her claims with evidence gathered through careful observation and detailed drawings (3-LS1-1).
	Open Mind Portraits	<i>The Watcher</i> , by Jeanette Winter, is a biographical picture book that follows the life of Jane Goodall from early in her childhood. The book is a great resource to introduce students, especially the younger ones, to the significance of making observations and asking questions in science (3-LS4-2).
	Readers Theater	<i>The Great Kapok Tree: A Tale of the Amazon Rain Forest</i> , by Lynne Cherry, highlights human impacts on Earth systems when animals, who live in a kapok tree, and a young man, tasked with cutting down the kapok tree, teach readers about interdependence and the importance of conservation (K-ESS2-2; K-ESS3-1; K-ESS3-3; 3-LS4-4; 5-ESS3-1).
	Readers Theater	<i>When Rain Falls</i> , by Melissa Stewart, explores what animals do when it rains in a forest, a field, wetlands, and a desert. A Readers Theater is available at <a href="http://peachtree-online.com/pdfs/WhenRainFallsRT.pdf">http://peachtree-online.com/pdfs/WhenRainFallsRT.pdf</a> (1-LS1-1; 4-LS1-1).



neck portrait of the scientist featured in the biography, cut it out, and then staple the portrait on top of several sheets of drawing paper which become thinking pages. The thinking pages contain drawings, symbols, and captions that represent the scientist's thoughts, activities, and key contributions to science.

Readers theaters are scripted dramatic presentations of books or other written material. Scripts are adapted from selected text and are read aloud by individual students or groups of students.

**EVALUATE**

Evaluation is designed to assess stu-

dent knowledge of science concepts and abilities (Bybee 2014). During this phase, teachers provide feedback to students through formal and informal assessments.

Trade books that contain science misconceptions, errors, or exaggerations work well in this phase because they allow students to evaluate their

TABLE 2 (CONTINUED)

Trade book examples aligned to the 5E instructional model.

5E PHASE	LITERACY STRATEGY	TRADE BOOK EXAMPLE
<b>Evaluate</b>	Students identify and correct errors or exaggerations in the text and/or illustrations	<i>Papa, Please Get the Moon for Me</i> , by Eric Carle, is a beautifully illustrated story featuring a young girl who asks her father to get the Moon for her so she can play with it. This classic children's book contains multiple science errors that students should be able to identify after studying Moon phases. The Moon phases on the title page are in the wrong order, the Moon physically changes size, and the father climbs on a ladder to get the Moon for his daughter (1-ESS1-1; 5-ESS1-2).
	Two Truths and a Lie	<i>The Very Hungry Caterpillar</i> , by Eric Carle, is a modern classic. In this story, a very hungry caterpillar eats its way through the book on its way to becoming an adult butterfly. Unfortunately, the food sources needed for growth are mostly inappropriate. Examples of two truths and a lie are 1. An adult butterfly lays eggs on leaves, 2. The butterfly eggs become caterpillars, 3. A butterfly caterpillar forms a cocoon. Statements #1 and #2 are true and statement #3 is a lie (3-LS1-1).
	Interactive Read-Aloud (pause for students to explain or predict)	<i>Planting the Trees of Kenya: The story of Wangari Maathai</i> , by Claire Nivola, uses rich illustrations and vivid text to tell the story of how Nobel laureate Wangari Maathai restored the land and empowered the people of her native Kenya. Teachers can stop at predetermined points and have students predict what will happen next in the story or explain the scientific processes behind observed events, such as why replanting the Kenyan forests helped reduce erosion. (4-ESS2-1; 5-ESS3-1)
	Interactive Read-Aloud (pause for students to explain or predict)	<i>One Plastic Bag, Isatou Ceesay and the Recycling Women of the Gambia</i> , by Miranda Paul, describes a creative recycling solution for plastic bags that were littering a village in Gambia. Pause during the read-aloud and ask students to identify the problems faced by the village and how Isatou's ideas transformed her community. What can the students do to recycle? How can they use science ideas to protect the Earth's environment? (K-ESS2-2; 5-ESS3-1)

ability to identify and correct the inaccurate text or illustrations. In addition, books that review patterns across a scientific concept or that include breaks between questions posed in the text and answers provided also allow opportunities for teachers to assess student learning. Strategies such as “two truths and a lie” and interactive read-alouds can improve student learning.

“Two truths and a lie” evaluates learning when used with a book containing misconceptions, errors, or exaggerations. Students are assessed on their ability to accurately identify “a lie” and/or “two truths” and justify their decisions. Students use information presented in the book to construct two true statements and one statement that is not true—the lie.

Interactive read-alouds can be used to check student understanding. Teachers choose to stop at predetermined pages in the book so that students can explain specific concepts or correct misconceptions embedded in the story.

## ONE BOOK, MANY 5E CONNECTIONS

Although many trade books are best suited for only one phase of the 5E Instructional Model, sometimes a book’s structure enables it to be leveraged across multiple 5E phases. *What Do You Do With a Tail Like This?*, by Steve Jenkins and Robin Page (see Table 2), is one such book. This book takes students on an exploratory journey of animal adaptations, including features such as noses, ears, tails, eyes, mouths, and feet. An introductory page provides close-up illustrations of a feature and raises a question

such as, “What would you do with a nose like this?” The following page zooms out to explore how animals use these features for specific functions. Informational text at the end of the book provides additional details about each adaptation.

Teachers could use this book in the Engage phase by reading aloud just the introductory pages and having students predict how the different noses, ears, or tails might help an animal meet their basic needs. It could also be used for parallel read-aloud during exploration. The class could read about the various structures that animals have as a mouth and then conduct an empirical investigation of structure-function relationships in bird beaks. This cycle of reading and investigating could be then repeated with a different set of adaptations. In the Explain phase, students could use the informational text at the end of the book to add to an interactive Word Wall of animal adaptations. Or, the book could be used to launch an Elaborate activity where students design their own illustrated pages of structure-function relationships and create a class book. Finally, teachers could evaluate student learning by using the pages with the introductory illustrations of various structures to probe students’ reasoning about how adaptations help animals meet their basic needs (1-LS1-1; 3-LS4-2; 3-LS4-3; 4-LS1-1).

## CONCLUSION

Thoughtful selection and use of trade books can provide a strong foundation for inquiry and enhance the 5E Instructional Model. Books can be used to launch a lesson or introduce

a problem that structures an investigation. They can explain scientific phenomena, introduce vocabulary, support interpretation of observations, frame real-world applications, present science as a human endeavor, and assess understanding. We hope teachers will revisit their school and classroom libraries, and look for trade books they can use to support inquiry instruction. High-quality trade books are everywhere—just look. They are hiding in plain sight! ●

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## INTERNET RESOURCE

- Outstanding Science Trade Books  
[www.nsta.org/publications/ostb](http://www.nsta.org/publications/ostb)

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