STUDENTS' CLOSE READING OF SCIENCE TEXTS

What's Now? What's Next?

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Are you wondering how to weave together the Common Core State Standards and the new Next Generation Science Standards as you support students closely reading science texts? This article offers a few very practical suggestions for making this your classroom reality.

Gearing up for changes in curriculum as the Common Core State Standards (Common Core State Standards [CCSS] Initiative, 2010) weave their way into schools, teachers experience a multitude of emotions—fear of change, a desire to embrace change, and for some, confusion about how to proceed. Although coming to grips with the specifics of the CCSS is challenging, supporting students' growth from *below* and *far below basic* achievement levels to levels at which they can closely read, discuss, and write about complex informational text is daunting. Through a "what's now, what's next" perspective, we explore instructional moves supportive of ascending performance as students closely read science texts, a genre often fraught with difficulty for many underperforming students.

Balancing Narrative and Informational Text Reading
What's Now?

Informational *text*, a specific form of nonnarrative text communicating information (National Assessment Governing Board, 2008), is defined by the CCSS (2010, p. 31) as including the following:

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- Biographies and autobiographies
- Books about history, social studies, science, and the arts
- Technical texts, including directions, forms, and information displayed in graphs, charts, or maps
- Digital sources on a range of topics

Primary and elementary students lack exposure to reading informational texts because teachers emphasize story (Duke, 2000; Hoffman, Roser, & Battle, 1993; Ness, 2011; Swanson, Wexler, and Vaughn, 2009) over informational texts and often read aloud narratives (Yopp & Yopp, 2006) rather than support independent reading of informational texts either in class or as homework (Wade & Moje, 2000). When science is taught, inquiry-based instruction through hands-on experiences often minimizes textbooks (Pearson, Moje, & Greenleaf 2010). Furthermore, since the testing requirements for No Child

Pause and Ponder

- Consider a science lesson in which you might incorporate a close reading.
- During each rereading, what text-dependent questions would you ask to get students to delve more deeply into an identified chunk of the text?
- Contemplate how partner or small-group collaborative conversations provide students opportunities to expand and consolidate their understandings of the author's message through the workings of the text, such as language patterns, structure, and cohesion.
- Think about how your observations of the students' performances during a close reading help you to identify both the science and literacy teaching points.

"Reading science texts can help students learn more about the social, biological, and physical realms of our world, and connect to real world issues."

Left Behind were enacted, 71% of elementary school districts nationwide have reduced time spent on subjects other than reading and mathematics (Jennings & Rentner, 2006); in many California schools, students receive little or no social studies or science instruction (Wineburg, 2006).

What's Next?

We assume that the CCSS assessments will mirror the 50/50 narrative/informational text balance suggested for fourth graders on national assessments (National Governing Board, 2008). Students will still read stories, but they will also read informational texts for 50% of the school day across all content areas. Findings from the 2009 National Assessment of Educational Progress confirm the need for more informational text in reading science; only 34% of fourth graders, 30% of eighth graders, and 21% of 12th graders performed at or above the "proficient" level in science.

Exposure to a range of informational text types is essential if students are to develop facility with this genre (Dreher & Voelker, 2004) because discourse forms differ within specific disciplines. The ability to read exposition, argumentation, persuasive, and procedural texts and documents require different skills (Shanahan & Shanahan, 2008), but all are critical to reading and understanding science (Saul, 2006). Informational science texts expose

students to the genre and linguistic registers characteristic of scientific discourse (Varelas & Pappas, 2006). As noted by Maloch and Bomer (2013), classroom instruction should provide detailed insights about differences associated with reading informational and narrative texts.

Science educators view reading as an important aspect of scientific inquiry (Douglas, Klentschy, Worth, & Binder 2006; Yore, Bisaz, & Hand 2003). According to Yore (2004), "good science educators recognize the centrality of literacy to the scientific enterprise" (p. 69). Reading science texts can help students learn more about the social, biological, and physical realms of our world and connect them with real world issues that affect us nationally and internationally. As informed everyday citizens, they will eventually cast intelligent, research-related votes on ballot issues addressing food safety, hazardous materials, energy, water use, and pollution. With developing understandings, some will even become the creators of important ideas and innovations.

Closely Reading Science Texts: Building From a Base of Instructional Knowledge
What's Now?
The CCSS call for students to critically read increasingly complex texts across content areas with the expectation that

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by high school graduation they will be able to read college or career-related texts. Doing so involves "the mindful, disciplined reading of an object (i.e. text) with the view to a deeper understanding of its meaning" (Brummett, 2010, p. 3). Very close reading involves analyzing the unfolding of all text dimensions, including language, form, argument, and ideologies within texts, emphasizing the particular over the general (Fisher & Frey, 2012; Richards, 1929).

Close reading represents *one type* of classroom reading in which a small or large group of students "have a go" at a text. Student(s) become the primary investigator(s) of the text and its meaning. During a close reading, students explore the deep structures of a text (Adler & Van Doren, 1940/1972), identifying the "bones" of the passage. They return to the text at the word, phrase, sentence, and paragraph levels to fully comprehend how the "important details fit together to support the author's central idea(s)" (Cummins, 2012, p.8). Selectively using the cognitive functions of remembering, understanding, applying, analyzing, evaluating, and creating (Anderson & Krathwohl, 2001), the reader draws on prior and immediate knowledge to support integrating new text information within existing information. "In reality, none of these cognitive functions or strategies is used in isolation, but instead, depending on what comprehension needs are triggered by the text, a proficient reader draws from his or her bank of familiar strategies to support meaning making" (Fisher, Frey, & Lapp, 2012, p. 20).

What's Next?
Science texts are especially suited for close reading because of their density and level of challenge. The language

used in some science texts far exceeds the experience and reading abilities of many students (Chui & Yong, 2010; Merzyn, 1987); furthermore, learning the language of science poses a major challenge to pupils (Wellington & Osbourne, 2001), because science has its own language. Closely reading scientific texts demands deep engagement with the text to understand its content (Pearson and Raphael, 1990), requiring students to assess the validity of text claims, infer meanings, and use text structures to facilitate comprehension.

Close text reading requires students to read a passage without in-depth pre-teaching or frontloading by the teacher. This differs from instructional practice in which teachers do so much frontloading that students never get a chance to "dig deeply" on their own. This does not mean that preteaching is never warranted if the teacher determines that some context is needed to support comprehension (Jago, 2012). In fact, as noted by Sandler and Hammond (2012/2013), the CCSS do not ban prior knowledge; teachers can accelerate student mastery of analytical reading by prompting, providing cues, and so forth to help students use prior knowledge during text reading, rather than frontloading. Through more of a back-filling rather than a frontloading process, teachers give students the initial opportunity to apply their bases of knowledge to text reading, just as they must do when reading independently.

Addressing Teachers' Concerns
K–5 teachers at a California school where we were providing professional development expressed concerns about teaching students to read challenging texts, particularly the CCSS text exemplars (see Appendix B of the CCSS). They found many of the texts relatively difficult, especially for English learners and striving readers. Several reluctantly admitted that they didn't know how to teach students to read informational texts. One fourth-grade teacher noted, "It just isn't part of my usual instructional practices and it wasn't a focus of my credential program." A second-grade colleague added, "I've been a teacher for 10 years, and none of my previous professional development efforts included any information about close text reading."

Their thoughts reflected the voices of others who are unclear about the instructional practice of close text reading. Together we created flexible, close reading instructional procedures that allowed teachers to decide how many times and in what ways to push the students back to the text for deepened understandings.

Close Reading Procedures
Teacher
Steps for preparing for close reading are as follows (steps 1 and 2 are interchangeable):
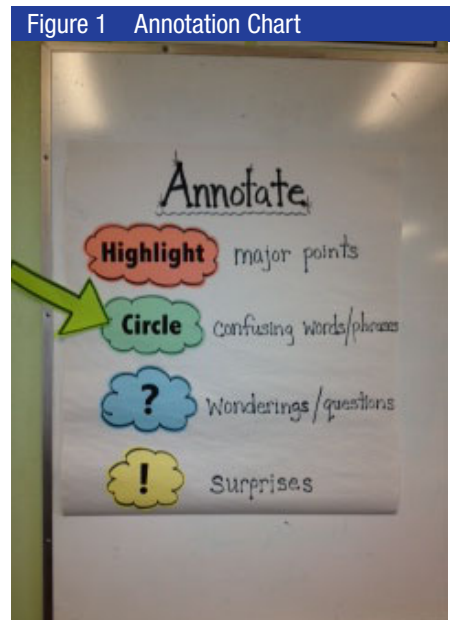
"Close reading represents one type of reading in which students 'have a go' at a text, becoming the primary investigator(s) of its meaning."

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1. Select "compact, short, self-contained texts that can be read and reread deliberately and slowly" (Coleman & Pimentel, 2012, p.4).

2. Identify the purpose(s) for the close reading, which may be to understand the gist, note distinctive language, identify key ideas, infer author craft and intention, analyze text structures and organization, or argue a position. Accomplishing the purpose may involve multiple readings; however, during each encounter, the purpose(s) for the investigation should be clear to students and supported by text-dependent questions.

3. Prepare the text for presentation by numbering lines, paragraphs, or stanzas to support ease of reference, focus, and discussion. If children cannot annotate and write in the text, lines can be numbered using small sticky notes. If teachers use shared reading with emerging readers, they should point to the section being read, identify where students should focus, and clarify how much of the passage should be read or listened to at a time.

4. Teach children how to annotate the text sparingly, because too much highlighting can cause children to lose focus. Students can annotate keywords or phrases, confusing concepts, inferences, main ideas, and so on, all related to the lesson purpose. They can highlight each in a different color, using colored highlighters or pencils. Pencils can also be used to circle and underline keywords or phrases that relate to the identified purpose (see Figure 1 as an example of an annotating chart).

5. Write text-dependent questions and prompts that will continually push the students back into the text for deeper analysis. Questions should "be answered by careful scrutiny of the text… and do not require information or evidence from outside the text or texts" (Coleman & Pimentel, 2012, p. 5). Questions should require children to search, synthesize, infer, and make text-supported judgments.

Students and Teacher

1. First reading—Teacher shares purpose and process. Students engage in the first reading and annotating, prompted by a posed question (e.g., What is the general information the author is sharing about…?).

2. Chatting and charting—Students share responses and annotations with a partner. If students cannot write in the text, annotations and information can be written on sticky notes or a graphic organizer.

3. Reading again—Based on insights from the conversation, the teacher asks additional text-dependent questions that return students to the text multiple times to accomplish the lesson purpose.

4. Chatting and charting— Conversation occurs after each return to the text. Responses should deepen after each reading and conversation.

5. Independence—At the conclusion of the reading, students,

Figure 1   Annotation Chart

independently or with others, engage in a task illustrating their understanding of the text (e.g.. writing text- supported arguments, a multimedia project, an opinion paper that uses text-based evidence, a collaborative poster, etc.).

Reflecting on the Procedures

After teaching students to closely read informational texts, these teachers were very pleased with the results, noting that they were in "awe of the deep thinking their students shared." Several stated that students loved the experience and wanted to "do it again, even though it made their brains tired. They surprised themselves with how much they were learning, even after their first reading."

"After teaching students to closely read informational texts, teachers noted that they were in 'awe of the deep thinking their students shared.'"

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Implementing the Procedures

The following examples illustrate a flexible implementation of these procedures by a first, and a fifth grade teacher as they teach students to closely read science texts.

First Graders Closely Read *Starfish*

Preparing for Close Reading

Before beginning the lesson based on the book *Starfish* (Hurd, 2000), a K–1 CCSS text exemplar, Ms. Weller read the text carefully while thinking about her students and the lesson purpose, which was to understand key features of starfish and address CCSS RI.1.2 ("Identify the main topic and retell key details of a text"). She identified language, ideas, and text features she needed to address and prepared text-dependent prompts/questions to push children back to the text to continually scaffold their understandings.

She also prepared a Foldable (Figure 2) that included these questions: Where do they live? What types of starfish are there? What body parts, do they have? How do they move? How do they reproduce? She had previously shown students how to "read with a pencil," demonstrating how she annotates using sticky notes when she wants to notice key vocabulary, record information, or question the text.

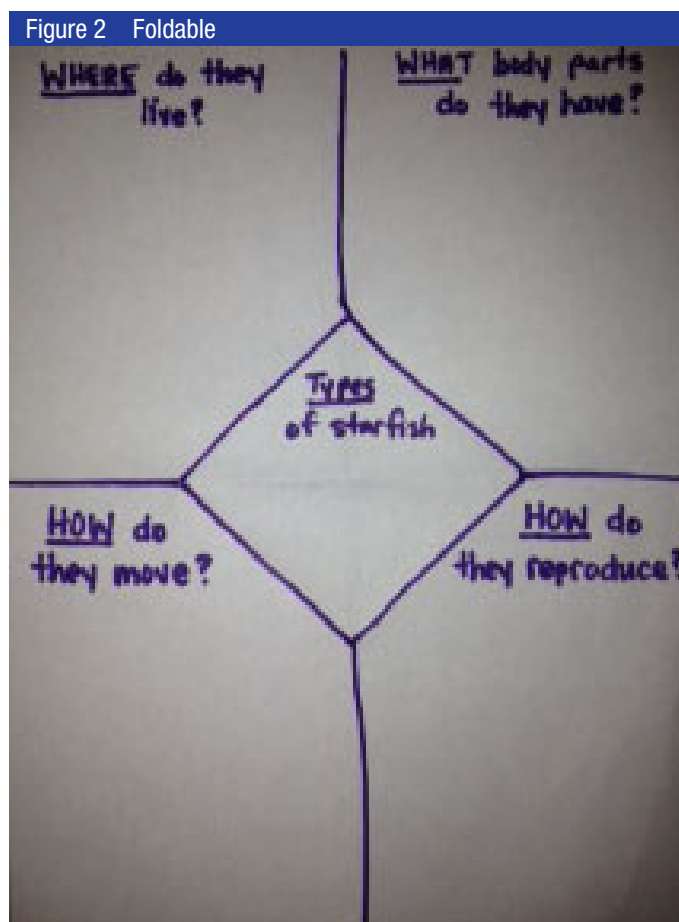### First Close Reading, Annotating, and Chatting

Ms. Weller began her the close, shared reading by explaining to students that they would be learning about key features of starfish. She displayed the book under the document camera so all could see the print and illustrations. She prompted the children to closely listen for information that identified what a starfish is, where starfish live, types of

starfish, their body parts, how they move, and how starfish reproduce. She provided students with a Foldable (Figure 2) containing each of these questions.

She read aloud chunks of the text, moving slowly, showing the illustrations on each two-page spread. Stopping every few pages, she asked children to annotate by writing or drawing on their Foldable what they remembered about each question. After students analyzed content independently, they partner-shared their Foldables with one another, noting what details they remembered.

Second Close Reading: Annotating, Chatting, and Expanding Understanding

Next children listened to the teacher read aloud pages one through three, which revealed where starfish live. They were then instructed to review their drawings and add details or write words they learned from these pages. Ms. Weller again invited partner talk, during which students shared their details. She continued chunking the text as children listened for more information about each question and added details onto the Foldable. As they did so, she listened in to support, assess understanding, and determine next instructional steps.

Figure 2   Foldable

Finding that most students could articulate where starfish live but were having trouble identifying their body parts, she prompted them to "return to the text to identify a body part that a starfish would have that we also have." Once they identified a feature such as eyes, she pushed them back into the text with the text-dependent question, "What is a feature or characteristic of a starfish that we don't have, but we use for the same purpose?" As they shared responses such as *arm* (*ray*), she helped them show and share where they located this information by approaching the document camera and using their hands to encircle the appropriate text sections. She reminded them of the importance of returning to the

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"A close reading need not involve three return visits to the text. The number depends on the lesson purpose and student performance."

text for evidence. Using their Foldables as a foundation, they formalized their thoughts through collaborative academic conversations about the text content and added new ideas to their Foldables.

Next Close Reading

Once students understood the features of starfish, Ms. Weller wanted them to focus on the craft of the text, emphasizing the author's descriptive language. To address CCSS RI.1.4 ("Ask and answer questions to help determine or clarify the meaning of words and phrases in a text"), she prompted, "What words does the author use to describe the starfish?" Again chunking the text, she invited student responses. She also asked questions about the author's word choices. For example, on page 10, she asked, "What two rhyming words does the author use to tell us how starfish move on their feet?"

After children identified *slide* and *glide*, she asked them to say the words to a partner and modeled her thinking: "Hmm, What does it mean to glide and slide? When I glide, I move without making noise. When I slide, I move smoothly, like sliding down a hill on the ice. Let's use our bodies to show what it means to glide and slide." She asked them to write *slide* and *glide* and illustrate these words on their Foldables under the section labeled *How do they move?*

After experiencing the text multiple times, Ms. Weller introduced

additional, challenging, text-dependent questions (Figure 3) designed to help students think more deeply about the text. The answer to one question (How do starfish find food and feed themselves?), which addressed CCSS RI.1.3 ("Describe the connection between two individuals, events, ideas, or pieces of information in a text"), required students to infer that they needed to locate answers to a single question on different pages of the text. She invited individuals to come to the document camera and point to the sections that had helped them infer this textual evidence. They discussed clues they found to answer the question.

Reading and Talking Transition to Writing

Once students understood the features of starfish, Ms. Weller asked, "What did the author want us to know at the end of this book?" Answering this question, which focused on CCSS W1.2 ("Write informative/explanatory texts, in which they name a topic, supply some facts

about the topic, and provide some sense of closure"), required students to support their inferred understandings with text-based information.

Ms. Weller asked students to listen (or chorally read with her if they were able to) as she read the entire text once more. She provided sentence frames to use for partner talk about the author's intent and their new information. She reminded them to look for ideas from the text to support their thinking about the starfish and also the author's intent.

- The author wrote this book to tell us that _____.
- After reading this book, I know that _____.

At the culmination of the close reading, the children used their Foldables and the sentence strips to write a report sharing what they had learned about starfish and what they were still wondering (Figure 4A and 4B).

Throughout the readings, Ms. Weller's observations of students' listening, thinking, reading, and writing made obvious their strengths and needs. In essence, observing their close text reading and chatting provided a formative assessment of the next instructional steps needed to support developing their independence

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Figure 3 Text-Dependent Questions for *Starfish* (Hurd, 2000)

What is a starfish? *(general understanding)*

Which body parts do starfish have and not have? (*key details*)

Who is telling us the information, the starfish or a narrator? How do you know? (*author's purpose*)

Why did the author write this book? To entertain or inform? (*author's purpose*)

What words does the author use to describe the starfish? (*vocabulary*)

What two words does the author use to tell us how starfish move on their feet? (*vocabulary*)

How do starfish find food and feed themselves? (*inference*)

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with the text. A close reading need not involve three return visits to the text. The number of revisits depends on the lesson purpose and student performance in relation to accomplishing the purpose.

Fifth Graders Closely Read *Hurricanes: Earth's Mightiest Storms*

In Mr. King's fifth-grade classroom, students were studying storms. Using an excerpt from *Hurricanes: Earth's Mightiest Storms* (see CCSS, Appendix B), he prepared students to independently read challenging informational texts and to scientifically understand hurricanes. At the onset, Mr. King shared that the purpose for reading the excerpt was to understand how changeable atmosphere creates storms. Here's how this lesson evolved.

First Reading

Students were presented with the text excerpt to read and answer the purpose-driven, text-dependent question, What two parts of the environment work together to create hurricanes? (Figure 5). This question addressed CCSS RI 5.3 ("Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text").

During the first reading, students annotated the text, a skill they had previously learned. They highlighted main ideas, circled confusing words or phrases, identified wonderings with question marks, and indicated surprise using an exclamation point. Because paragraphs in the excerpt were numbered, students in later discussion identified where they found information about how the environment works to create hurricanes and shared difficult
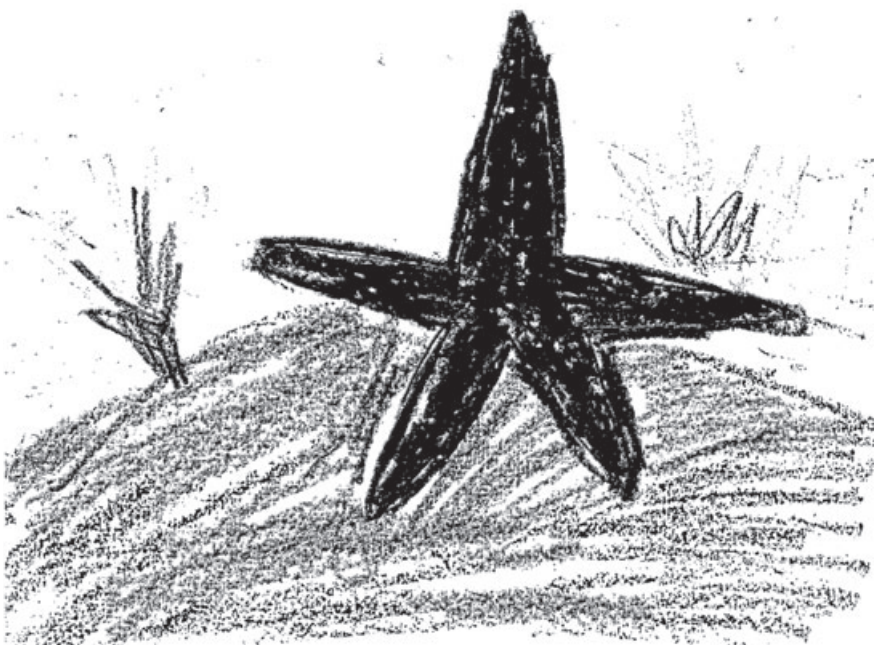
Figure 4   My Starfish Report

(A)

My Starfish Report

I know that Starfish live_____. I read

about_____and_____

_____which are different types of Starfish.

Starfish have _____and_____.

They _____and _____to move about in

the water. They reproduce by_____. The

author wrote this book about Starfish because_____.

(B)

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"Listening in on student discussions provides an opportunity for assessment and support."

words and phrases. They indicated where they put question marks beside confusing lines and recorded questions in the text margins. Responses to the first text-dependent question could be answered with a simple, single-sentence response (The two parts are atmosphere and tropical waters.); however, to arrive at this, students had to navigate complicated science ideas bobbing around in a sea of academic and topical vocabulary.

It is precisely through these complex "waters" of informational language that Mr. King wanted his fifth graders to navigate. He later explained why he engages students in closely reading texts:

> I know that I can't be standing over their shoulders when they are at home reading *Scientific American* or in the school library researching for a science fair project. I need to empower them to move through tough science language with the skill and fortitude of a captain expertly moving his ship through uncharted waters. I want students to feel they are limitless when it comes to reading informational text. I don't want them to be held back by language—academic or topical.

Mr. King does not leave students to struggle with challenging vocabulary or confusing concepts. Instead, he strategically listens in as students share responses to initial questions through partner conversations. When students can't provide the expected response, he poses another text-dependent question that helps them home in on the targeted ideas. When Andrew wondered why the text referred to the atmosphere as "the envelope of air that surrounds the earth and presses on its surface," Mr. King asked him to make an intertextual connection by asking, "Remember the description of the atmosphere in our reading on Tuesday and the diagram in the text? How is the atmosphere like an envelope?"

Andrew pondered this and tentatively responded, "Well, an envelope covers a letter—It goes around it. And the air of the atmosphere goes around the Earth. I guess they are both covers for something, and I remember from the reading that air

has a little weight. Maybe that's why it presses on Earth." Listening in on student discussions about text-dependent questions provides an opportunity for assessment and support—one that Mr. King intentionally uses as a mechanism for offering differentiated instruction.

Next Reading
The next text-dependent question intentionally focused on key vocabulary. Mr. King asked students to read to answer the question, How are areas of high and low pressure different? As he moved through the room monitoring student's additional annotations, he noted that a few students made comparison charts in the text for the purpose of differentiating between high- and low-pressure systems. Others drew arrows to text sections and labeled them *high* and *low*. After the reading, students talked with partners to see if their ideas differed or were in agreement.

Listening in on one conversation, Mr. King noticed that two students seemed confused about how high and low pressures connected to storms. One student thought that both low- and high-pressure areas were connected to hurricanes. His partner, pointing to the last line of the text, countered, "It says that low-pressure

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Figure 5   Text-Dependent Questions for *Hurricanes: Earths Mightiest Storms* (Lauber, 1996)

What two parts of the environment work together to create hurricanes? (*general understanding*)

How is the atmosphere like an envelope? (*vocabulary*)

How are areas of high and low pressure different? (*vocabulary*)

What role might changes in air pressure play in creating a hurricane? (*inference*)

What do scientists look for when they are predicting the formation of a hurricane? (*inference*)

Do you agree with the author that hurricanes are earth's mightiest storms? (*opinions, arguments, intertextual evidence*)

What effect might increased ocean temperatures, due to global warming, have on the development of hurricanes? (*opinions, arguments, intertextual evidence*)

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"Students used the text to make connections and to seek evidence to support the notion that hurricanes are formed in part because of changes in air pressure."

areas over warm oceans give birth to hurricanes. I think this means hurricanes are formed where there's low pressure not high." Given this text-based evidence, both partners agreed that low-pressure systems correspond to storm formation. This interaction confirmed for Mr. King that text-based questions push students to deepen their understandings.

Third Reading

This time Mr. King reminded students of a previous lesson in which they discussed the layers of the atmosphere, viewed a demonstration of a soda can crushed by air pressure, and talked about sea and land breezes. He asked, "What role might changes in air pressure play in creating a hurricane?" This is clearly a complex, inferential, text-dependent question that cannot be fully determined from a single, cursory text reading. Students needed to attend to the language used to describe changes in air pressure (high and low pressure) and draw on previously studied understandings of wind and atmosphere by making intertextual connections. This text-dependent question guided their attention to language and prior knowledge to deepen understanding and pushed them toward multilayered thinking, which required students to address CCSS RI.5.8 ("Explain how an author uses reasons and evidence to support particular points in a text, identifying

which reasons and evidence support which point[s]").

He reminded them when annotating to draw arrows showing connections among ideas. Again, using student responses as a formative assessment tool, Mr. King clearly and quickly scanned annotations to see who was documenting appropriate sections of the text in response to the question. Several students highlighted fragments of this sentence from the text: "Other storms may cover a bigger area or have higher winds, but none can match both the size and the fury of hurricanes." In conjunction with this, they noted thoughts that connected hurricanes to strong winds.

Others noted that low-pressure systems are connected with storms, as they highlighted the following line: "There are days when a lot of air is rising and the atmosphere does not press down as hard." During subsequent chatting, he noted that although not every student could answer the question like a veteran meteorologist, all were concentrated on the complex science language and prior knowledge related to air, pressure, and winds. Students referenced the text to note that low-pressure air occurs "when hot air is rising."

Marley emphatically stated, "Hot air rises and cooler air sinks. Remember when we studied how heat moves." Oscar added, "Look at the first paragraph—It says that hurricanes are 'feeding on warm, moist air.' That

must be the rising, warm air that makes it low pressure. I wonder if high pressure air is colder and drier?" Students used the text to make connections and to seek evidence to support the notion that hurricanes are formed in part because of changes in air pressure.

Final Reading

For the final reading, Mr. King provided students with a text-dependent question to which they could respond in the form of a news article: "Imagine that you are writing for an online science journal. Your editor asks you to respond to this question in writing: What do scientists look for when they are predicting the formation of a hurricane?" Mr. King assigned students a coauthor with whom they would write a response addressing this standard: "Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably" (CCSS RI.5.9). He asked two additional questions that required students to make inferences, document opinions, and make intertextual connections as they prepared their article.

Students were strategically partnered to share ideas using academic language rooted in text-based information. They first completed an independent next reading of this text, taking notes and jotting down ideas for the article. Then they wrote and conducted further research using a teacher-selected bank of online resources. Mr. King listened in as students discussed key aspects of the text (hurricanes are born in tropical waters; they feed on warm, moist air).

Students reread, examined ideas, and negotiated meaning before coauthoring articles that drew on their

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combined banks of word knowledge. Referring to academic language templates posted on the classroom wall that offered sentences starters (Even though… In conclusion… According to…), they crafted their responses. Connecting close reading to real-world applications and writing tasks motivated students to review the text with attention to detail, language, and background knowledge.

TAKE ACTION

1. Choose an appropriate informational text—one that seamlessly connects to standards-based content.

2. Plan for students to do the initial reading of the text as they respond to (a) foundational text-dependent question(s). Develop a note-taking guide or protocol for recording information.

3. Provide students with an opportunity to talk with peers about the reading.

4. Offer another deeper level text-dependent question that requires students to return to the text for a second reading. Remind them to use their pencils to note ideas, questions, and areas that need clarification.

5. Monitor student progress and determine whether scaffolds are needed.

6. For additional readings, ask questions that require students to draw on prior knowledge, make connections to learned content, infer ideas, argue a position, and speculate on extensions of the text. Be sure that students have a chance to record deeper thinking in the form of added notes or a written summary.

Conclusion: Scaffolds are Removed as Students Gain the Skill of Closely Reading

Some informational texts require student knowledge of the topic, whereas others do not. Instruction depends on the students and the texts. As is apparent in both examples, the initial student reading helped teachers determine "next steps." Students were permitted to struggle a bit as they negotiated meaning and oriented themselves to the text. Through this effort, students build the capacity to approach challenging texts with a steadfast, determined attitude and develop the capability to find meaning from challenging texts.

Students learned to follow the initial read-through of the text, with a second, third, or fourth read, each time documenting deeper insights and learned concepts through their annotations. Asking text-dependent questions guided and focused student reading; students read with a purpose in mind, drawing on previously read texts and learned information to infer meanings and facilitating interaction with the text—all behaviors of highly proficient readers. They acquired and internalized text knowledge and used it in academic conversations and writing to share fact-supported arguments. As noted by these teachers, closely analyzing a text helped students gain a deeper understanding of the information, the ability to critically communicate the information, and, best of all, enjoy the process.

REFERENCES

Adler, M., & Van Doren, C. (1940/1972). *How to read a book: The classic guide to intelligent reading.* New York, NY: Touchstone.

Anderson, L.W., & Krathwohl, D.R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives.* New York, NY: Longman.

Brummett, B. (2010). *Techniques of close reading.* Thousand Oaks, CA: Sage.

Chambliss, M.J., & Calfee, R.C. (1998). *Textbooks for learning.* Oxford, UK: Blackwell.

Chui, B., & Yong, S. (2010). Can students read secondary science textbooks comfortably? *International Journal of Science and Math Education, 2*(1), 59–67.

Coleman, D., & Pimentel, S. (2012). *Revised publishers' criteria for the common core state standards in English language arts and literacy, grades 3-12.* National Association of State Boards of Education. Retrieved from http://www.corestandards.org/assets/Publishers_Criteria_for_K-2.pdf

Cummins, S. (2013). *Close reading of informational texts: Assessment-driven instruction in grades* 3-8. New York, NY: Guilford.

Common Core State Standards Initiative. (2010). *Common core state standards for English/language arts and literacy in history/social studies, science, and technical subjects* [PDF document]. Retrieved from http://www.corestandards.org/assets/CCSSI_ELA%20Standards.pdf

Dreher, D., & Voelker, A.N. (2004). Choosing informational books for primary-grade classrooms: The importance of balance and quality. In E.W. Saul (Ed.), *Crossing borders on literacy and science instruction: Perspectives on theory and practice* (pp. 260–276). Newark, DE: International Reading Association.

Douglas, R., Klentschy, M., Worth, K., & Bender, W. (Eds). (2006). *Linking science and literacy in the K-8 classroom.* Arlington, VA: National Science Teachers Association.

Duke, N.K. (2000). 3.6 minutes per day: The scarcity of informational texts in first grade. *Reading Research Quarterly, 35*(2), 202–224.

Fisher, D., & Frey, N. (2012). Close reading in elementary schools. *The Reading Teacher, 66*(3), 179–188.

Fisher, D., Frey, N., & Lapp, D. (2012). *Teaching students to read like detectives: Comprehending, analyzing, and discussing texts.* Bloomington, IN: Solution Tree.

Hiebert, E.H., & Pearson, P.D. (2000). Building on the past, bridging to the future: A research agenda for the Center for Improvement of Early Reading Achievement. *The Journal of Educational Research, 93*(3), 133–144.

Hoffman, J.V., Roser, N.L., & Battle, J. (1993). Reading aloud in classrooms: From the modal to a "model." *Reading Teacher, 46*(6), 496–503.

Jago, C. (2012, November). Closer reading for deeper comprehension: Uncommon sense about the common core. *Adolescent Literacy in Perspective.* Retrieved from http://www.ohiorc.org/adlit/inperspective/issue/2012-10/Article/feature.aspx

Jennings, J., & Rentner, D.S. (2006). Ten big effects of the No Child Left Behind Act on public schools. *Phi Delta Kappan, 88*(2), 110–113.

Maloch, B., & Bomer, R. (2013). Informational text and the common core standards: What are we talking about? *Language Arts, 90*(3), 205–211.

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STUDENTS' CLOSE READING OF SCIENCE TEXTS: WHAT'S NOW? WHAT'S NEXT?

Merzyn, G. (1987). Language of school science. *International Journal of Science Education, 43*(3), 285–295.

National Assessment Governing Board. (2008/2009). *Reading Framework for the 2009 National Assessment of Educational Progress.* Washington, DC: U.S. Government Printing Office.

Ness, M. (2011). Teachers' uses of and attitudes toward information text in K-5 classrooms. *Reading Psychology, 32*(1), 28–53.

Pearson, P.D., Moje, E., & Greenleaf, C. (2010). Literacy and science: Each in the service of the other. *Science, 328*(5977), 459–463.

Pearson, P.D., & Raphael, T.E. (1990). Reading comprehension as a dimension of thinking: Implications for reform. In B.F. Jones & L.I. Idol (Eds.), *Dimensions of thinking and cognitive instruction: Implications for reform* (Vol. 1, pp. 209–240). Hillsdale, NJ: Erlbaum.

Richards, I.A. (1929). *Practical criticism.* London, England: Cambridge University Press.

Sandler, S., & Hammond, Z. (2012/2013). Text and truth: Reading, student experience, and the common core. *Phi Delta Kappan, 94*(4), 58–61.

Saul, E.W. (2006). *Crossing borders in literacy and science instruction: Perspectives on theory and practice.* Newark, DE: International Reading Association.

Shanahan,T., & Shanahan, C. (2008). Teaching disciplinary literacy to adolescents: Rethinking content-area literacy. *Harvard Educational Review, 78*(1), 40–59.

Swanson, E.A., Wexler, J., & Vaughn, S. (2009). Text reading and students with learning disabilities. In E.H. Hiebert (Ed.), *Reading more, reading better* (pp. 210–230). New York, NY: Guilford.

Varelas, M., & Pappas, C.C. (2006). Intertextuality in read-alouds of integrated science-literacy units in primary classrooms: Opportunities for the development of thought and language. *Cognition and Instruction, 24*(2), 211–259.

Wade, S.E., & Moje, E.B. (2000). The role of text in classroom learning. In M.L. Kamil, P.B. Mosenthal, P.D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (Vol. III, pp. 609–629). Mahwah, NJ: Lawrence Erlbaum.

Wineburg, S. (2006). A sobering big idea. *Phi Delta Kappan, 87*(5), 401–402.

Yopp, R.H., & Yopp, H.K. (2006). Informational text as read-alouds at school and home. *Journal of Literacy Research, 38*(1), 37–51.

Yore, L.D. (2004). Why do future scientists need to study the language arts? In W.E. Saul (Ed.), *Crossing borders in literacy and science instruction: Perspectives on theory and practice* (pp. 71–94). Newark, DE: International Reading Association.

Yore, L.D., Bisanz, G.L., & Hand, B. (2003). Examining the literacy component of science literacy: 25 years of language arts and science research. *International Journal of Science Education, 25*(6), 689–725.

LITERATURE CITED

Hurd, E.T. (2000). *Starfish.* New York, NY: HarperCollins.

Lauber, P. (1996). *Hurricanes: Earth's mightiest storms.* New York, NY: Scholastic.

MORE TO EXPLORE

Books

- Fisher, D., Frey, N., and Lapp, D. (2012). *Text complexity: Raising rigor in reading.* Newark, DE: International Reading Association.

- Grant, M., Fisher, D., & Lapp, D. (2014). *Teaching students to think like scientists.* Bloomington, IN: Solution Tree Press.

IRA Journal Articles

- Fisher, D., & Frey, D. (2012). Close reading in elementary schools. *Reading Teacher, 66*(3), 179–188. doi: 10.1002/TRTR.01117

- Lapp, D., Moss, B., Johnson, K., & Grant, M. (2012, Fall). Teaching students to closely read texts: How and when. *IRA E-ssentials.* Available at http://www.reading.org/general/Publications/e-ssentials/e8022

Common Core Informational Videos

- Balancing Informational Text and Literature: www.engageny.org/resource/common-core-in-ela-literacy-shift-1-pk-5-balancing-informational-text-and-literature

- Text-Based Questions: www.engageny.org/resource/common-core-in-ela-literacy-shift-4-text-based-answers