Reading and Writing Strategies *for the* Secondary

SCIENCE

Classroom *in a* PLC at Work®

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TABLE OF CONTENTS

Reproducible pages are in italics.

Every Teacher Is a Literacy Teacher

In this series of books, called *Every Teacher Is a Literacy Teacher*, we focus on how each subject area in the grades 6–12 experience has a need to approach literacy in varying and innovative ways. To address this need, we designed each book in the series to:

- Recognize the role every teacher must play in supporting the literacy development of students in all subject areas throughout their schooling
- Provide commonly shared approaches to literacy that can help students develop stronger, more skillful habits of learning
- Demonstrate how teachers can and should adapt literacy skills to support specific subject areas
- Model how a commitment to a PLC culture can promote the innovative collaboration necessary to support the literacy growth and success of every student
- Focus on creating literacy-based strategies in ways that promote the development of students' critical-thinking skills in each academic area

You may immediately recognize how this approach differs from many traditional school practices and formats, where educators view literacy development as the job of English language arts (ELA) teachers, reading teachers, or teachers of English learners. It is an accepted practice that these teachers bear the responsibility of teaching skills like vocabulary development, comprehension skills, inferential skills, and writing skills. In stand-alone ways, they shoulder the charge to

single-handedly support the literacy growth of students. While these teachers and traditional education approaches may be effective to a degree, we recognize the need for our schools to support changes that make teaching literacy a responsibility for all teachers. In this book, which focuses on the science classroom, we propose that schools adopt the collective commitment that every teacher is a literacy teacher. This commitment means we must support collaboration between expert science teachers and experts in literacy using processes similar to in the story of Cami that we detailed in this book's preface (page xvi).

As we begin to aggressively address literacy issues in our classrooms, PLCs need to recognize the value of supporting literacy skills within every classroom—and every content area. Science teachers need to be literacy teachers. Mathematics teachers need to be literacy teachers. Social studies teachers need to be literacy teachers. World language and fine arts teachers need to be literacy teachers. Every teacher needs to be a literacy teacher. By making literacy a core commitment in the work of every academic discipline, schools can begin to develop students' abilities to read and write with a variety of more focused literacy strategies that support the critical-thinking skills necessary for science, social studies, mathematics, language acquisition, and the fine arts.

In this book, we emphasize how building collaboration among science teachers and literacy experts will be one of our greatest catalysts for supporting student growth in every area of school curriculum, and we stress a strong commitment toward building instructional improvements that can support the growth of every learner. As we've seen in many PLC cultures, collaboration generally begins with teaming teachers within like disciplines. Science teachers team with other science teachers, social studies teachers team with other social studies teachers, and so on. When teams form according to discipline, they tend to focus only on their content and discipline-based skills. We intend for this book to encourage collaboration of a different sort—collaboration among literacy and science experts teaching middle school and high school. When discipline-based teachers and literacy experts team up, they can build stronger approaches to teaching and learning that connect literacy-based strategies with discipline-specific subject areas. When these two forces come together to collaborate, we begin to see positive results.

As we constructed this book, we recognized that many schools do not have *literacy experts* (English teachers, reading teachers, reading specialists, and so on) available to collaborate with science teachers around the challenges of building stronger scientific readers and writers. To that end, we encourage you to use this book as a thought partner with your team or as your own personal literacy expert that can

help you generate changes to support student learning. In either case, we mean for this book to be a helpful companion as you deepen conversations and navigate choices that will positively affect student growth and development, and we structured the text to demonstrate how to not only develop collaborative practices but also support both individual readers and teams in becoming reflective practitioners.

As you will see, this book provides, describes, and details many literacy-based strategies that you can integrate into the science classroom. You can use many of the strategies immediately; others require preparation. In either case, we highly encourage getting started. Integrating focused literacy strategies into the science classroom initiates and promotes significant gains in learning, deep comprehension, and the capacity to think critically.

There are many reasons why science teachers in grades 6–12 need to be literacy teachers. Reading about science, writing about science, and thinking like a scientist require a mindset that focuses on elements of reading and writing that are fundamentally different from reading fiction or history or the news. Reading and writing about science requires the following.

- A close attention to detail
- An understanding of how details interconnect to build conceptual understandings
- The ability to interpret and synthesize data

Literacy strategies create an infrastructure of supports that allow students to enter into science, rather than do an exercise in memorization and information recall. Instead, stronger literacy strategies provide the necessary skills that support students' abilities to think like scientists with prereading, during-reading, and post-reading experiences that are interconnected to the demands of becoming a young scientist. We believe it is necessary to make use of literacy strategies in a way that supports the thinking of science, and there are many innovative, engaging ways to support that commitment.

The Need for Literacy Instruction

Picture a reader who is just beginning to learn how to read. What behaviors do you see as this student engages with text? What is he or she learning to do first? How is he or she grappling with the challenge of learning how to read? Chances are, you visualize this reader at the beginning stages, working to crack the alphabetic

code—breaking apart and sounding out words, one syllable at a time, and likely dealing with simple language and colorful text. The words the student is trying to read are already ones that he or she likely employs in conversation. This student is engaging in growing basic literacy skills—decoding, fluency, and automaticity. During this early phase of learning how to read, comprehension and meaning making almost take a back seat to decoding. The reader is working on the mechanical process of learning to read.

As readers advance beyond the beginning stages of reading and advance in their abilities to read, they become more fluent and able to comprehend a text. At this point, the advanced reader possesses the ability to make meaning from what he or she reads—the process of reading is no longer dedicated to the mechanical process of encoding and decoding a text. Instead, the process of reading is dedicated to learning and thinking. More advanced readers are able to infer from and analyze what they read in a book, as well as what they read in the world, even when they have limited experience with a topic. Such readers possess the critical literacy skills they will need for college and success in the workplace. These critically literate students are ready to take on complex tasks and dive into disciplinary literacy tasks—tasks that are specific to particular subject areas like science.

Now, what about the reader who is somewhere between these two phases—the reader who is not a beginning reader and is not an advanced reader? What about the student who can break the code—he or she can encode and decode—but struggles to apply this information to make new understandings? The reality that we all know and experience in our classrooms is that there are many students who fall into this place along the continuum, and there are many students who leave our high schools without the essential life skill of being critically literate. In fact, National Assessment of Educational Progress (NAEP) results detailed in *The Condition of Education 2018* report (McFarland et al., 2018) suggest that only 36 percent of eighth-grade students and 37 percent of twelfth-grade students possess literacy skills at or above the level of proficiency and over 60 percent have not met this readiness benchmark. This means that a majority of students are moving through middle school and high school without developing the literacy skills necessary to be successful in science classrooms. This is the group of students with which we are most concerned in this book. We know that this large group of students requires greater attention and a greater concentration on skill development. Moreover, a specific portion of these students will continue to need support in even basic literacy skill development. It is this portion of our student population

that seems to be the conundrum—often these are the students teachers struggle to support.

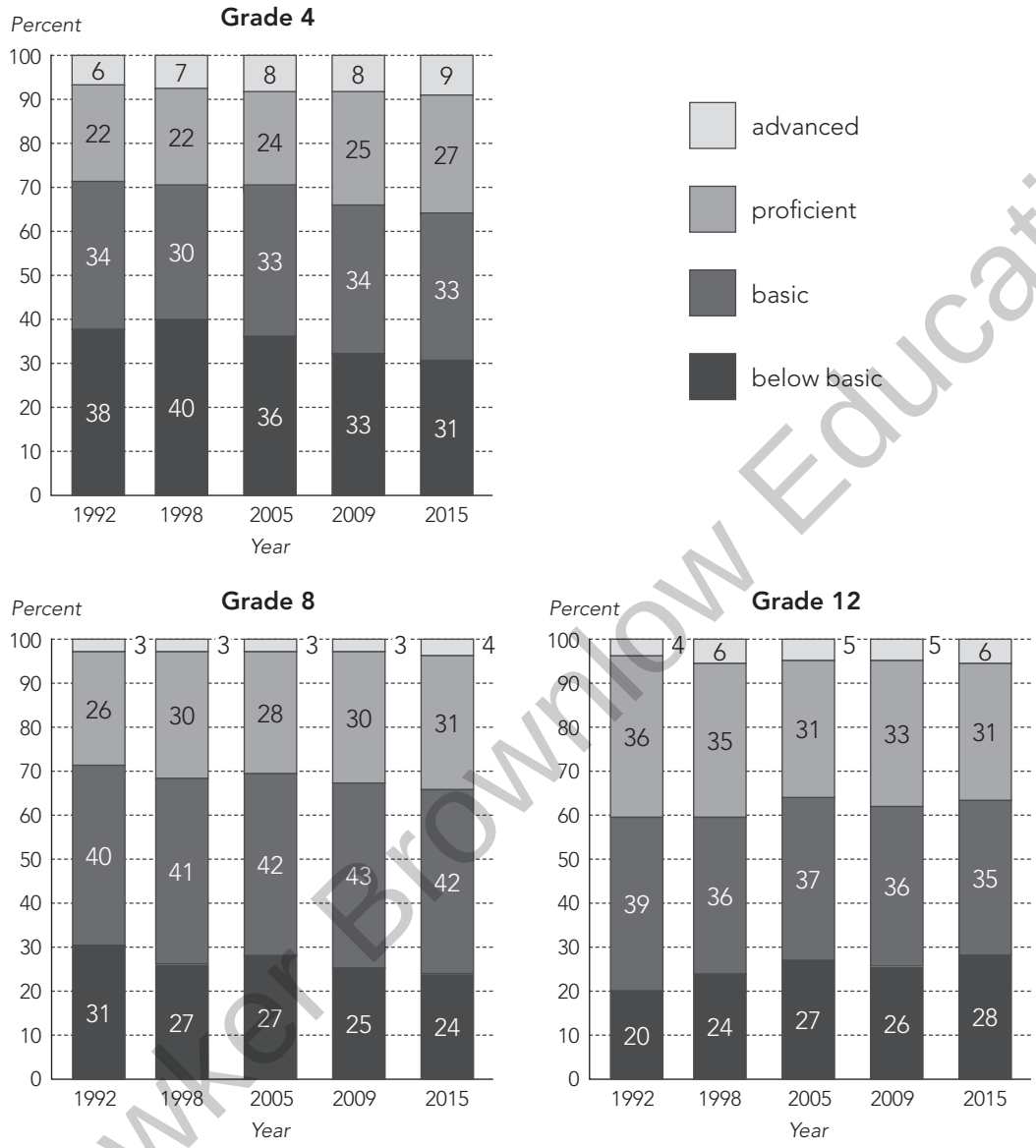
A science curriculum is often incredibly challenging for students who struggle with their developing literacy skills. Unfortunately, the struggle among many of this group of students is not always transparent even though they make up the majority of students in American classrooms. The graph in figure I.1 (page 6) represents the increasing gap in literacy as students grow up within schools, boldly demonstrating the challenges we must work to solve as educators in schools. In our PLCs, we must all shoulder the responsibility of student literacy and address these alarming statistics.

Research confirms there is a real need for disciplinary literacy instruction in the science classroom. Timothy and Cynthia Shanahan (2008) note the following.

- Adolescents in the first quarter of the 21st century read no better—and perhaps worse—than the generations before them.
- For many students, the rate of growth toward college readiness actually decreases as students move from eighth to twelfth grade.
- American fifteen-year-olds perform worse than their peers from fourteen other countries.
- Disciplinary literacy is an essential component of economic and social participation.
- Middle and high school students need ongoing literacy instruction because early childhood and elementary instruction do not correlate to later success.

Among the many concerns within collaborative discussions about teaching and learning, literacy continually ranks as one of the most worrisome. In many of our discussions with teachers throughout North America, teachers across academic disciplines express three running concerns: (1) many students struggle with basic literacy skills, (2) many students read and write below grade level, and (3) many students do not know how to complete reading or writing assignments.

Gaps in literacy skills are staggering, and these gaps affect all areas of many students' education. As students are marched through their schooling, the statistics demonstrate that gaps in literacy increase over the course of many students' elementary, middle, and high school years. Columbia University Teachers College (2005) reports many students find themselves reading three to six grade levels



Note: Includes public and private schools. Achievement levels define what students should know and be able to do: Basic indicates partial mastery of fundamental skills, and Proficient indicates demonstrated competency over challenging subject matter. . . . Testing accommodations (such as extended time, small-group testing) for children with disabilities and English language learners were not permitted in 1992 and 1994. Although rounded numbers are displayed, the figures are based on unrounded estimates. Detail may not sum to totals because of rounding.

Source: U.S. Department of Education, National Center for Education Statistics, National Assessment of Educational Progress, n.d.

Figure I.1: Percentage distribution of fourth-, eighth-, and twelfth-grade students across NAEP reading achievement levels.