Preface

Perhaps the greatest idea that America has given the world is education for all.

—R. Hutchins

Teacher learning is an evolutionary process in which this learning must be linked to classroom practice. Building on this connection, teachers are more likely to implement what they have learned to contribute to the academic success of their students. This book endeavors to change the dynamics of teacher learning and subsequent student learning. My hope is to empower and engage teachers in purposeful and relevant instructional experiences that link current research with effective science classroom practice.

Features of the Book

The contents of this book are derived from (1) a sequence of professional development sessions with teachers and principals, (2) conference presentations, (3) consultations with school administrators and teachers at individual campuses, (4) some 47 years of teaching experience, and (5) coaching school leaders to find ways to better support English learners in science. The ideas and strategies in this book have been "field tested" over many years in elementary, middle, and high school monolingual, dual-language, and bilingual science classrooms, as well as in university courses across the country.

Learning science is a tall order for students who come to school with different cultural and language backgrounds and varying levels of proficiency in English. This presents a challenge for both students and their teachers. To complicate matters, science has a

demanding academic vocabulary, including multisyllabic words that are often hard to pronounce, complex definitions to understand and remember, and visuals that are often difficult to comprehend. Accordingly, "doing science" sets the stage for students to use communicative language in the classroom. This approach moves science away from strictly using textbooks and other print materials to integrating science literature and more kinesthetic experiences into the learning process.

As teachers expand their instructional repertoire, their students learn in a comfortable environment that encourages them to test their science knowledge and language skills. Whether it is singing a song about clouds, exploring shadows using outlines of their bodies on the school grounds at different times of day, reading short science fun facts on the inside of Snapple caps, and/or recording observations of different objects in their science notebooks, students have multiple opportunities to enjoy learning science and to use their listening, speaking, reading, and writing skills.

This book is based on three fundamental principles to grow language in grades K–5 science classrooms:

1. Building teacher capacity to meet students' instructional needs
2. Valuing students' educational, cultural, and linguistic diversity
3. Appreciating and understanding the interdependence of teaching and learning

It also lays the foundation for contextualizing language by framing instruction within the 5E model (Engage, Explore, Explain, Elaborate, and Evaluate). Students put their language to work as they participate in each of the 5Es, and in doing so, they develop and expand their scientific understanding.

A key feature of this book, the codevelopment of science and language learning, stems from working with science teachers, dual and bilingual teachers, and their students, as well as from my ongoing research. This book distinguishes itself from other supplementary K–5 instructional resources in three distinct ways. First, it serves as a bridge connecting research and practice within the existing and evolving social, cultural, and linguistic landscapes of elementary schools. Second, the book provides a window into language-rich science classrooms, rendering a smoother transition for English learners to experience success in science. Third, it presents a language-centered approach using a variety of exercises, investigations, and games that

teachers can easily adopt to supplement their existing science programs, thereby further benefitting all their students.

Highlights for Setting the Stage for Growing Language in Science

Learning science is a cumulative process that commences in the early grades and builds a developmental path for learning science and growing language. Understanding this learning progression is essential for planning and teaching science topics in ways that are described in the *Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Disciplinary Ideas*.

The *Framework* sets the tone for what it means to be proficient in science. Teaching and learning science build on the notion that science knowledge is based on evidence that is continually being extended, refined, and revised. It is this vision that I embrace, and that is reflected throughout the book. In the *Framework*, there are three grade bands—K–5, 6–8, and 9–12—and this book focuses on the first, grades K–5.

The book includes a vast array of strategies in the form of exercises, investigations, and activities that teachers can use to enrich their science programs. Many of these have been uploaded to the companion website for easy access. The book also complements the current national, state, and district curricula and science and language standards in providing a structure for lifelong teacher learning.

Young students have a joy of learning and get excited about almost everything; they are curious about what they hear or see, and about how things work. As a first grader has said about science, it is "figyoring theings oat." Students' natural curiosity propels them to explore, using their senses, language skills, and cognitive abilities. And the quality of these exciting "science journeys" that students want to talk about and share is determined by their teachers.

Tapping into students' natural curiosity gives science teachers an advantage that many other teachers do not enjoy. Science becomes the ideal environment in which to grow language because, as Rachel Carson notes in *Silent Spring*, students want to share what interests them. And it is through this sharing, using the communication skills of listening, speaking, reading, and writing, that they increase their language proficiency.

The book begins with a brief discussion of the role that curiosity plays in science. Students come to school having an innate desire to learn, and they bring this desire to the science classroom, which makes

a world of difference in growing their language. Science is a motivator and an academic engine for utilizing language. But it is the teacher who is crucial in fostering students' natural curiosity by implementing best inquiry practices that capitalize on the students' desire to learn.

This book seeks to heighten teachers' awareness of the critical role that language plays in science. When planning lessons, knowing the science is important, but so is awareness of language use for communication and learning, such as in print materials, argumentation, and discourse, that come into play when learning science. Science serves as a catalyst for students to use their language skills in relevant and purposeful ways both in the classroom and at home with family members.

Design and Organization of the Book

Throughout the book, figures and illustrations serve to enrich the textual discussions. Each chapter has a quotation, an introduction, a conclusion, and a section that includes opportunities for readers to think further about the content in and across chapters. Taking the time to reflect offers opportunities to think about the information presented in the light of the reader's instructional practices. Implementing reflection practices often becomes a challenge because it requires "wait time" for teachers to think and make informed decisions. There are many ways to engage in reflective practices:

Chatting with others, including your students	*Jotting down* ideas to be explored later	*Pausing* and routinely stepping back
Observing your classroom and students	*Documenting* what you and your students are doing	*Seeing* through the eyes of your students
Partnering with colleagues, parents, and administrators	*Reading* to keep current	*Joining* network blogs and sharing your issues and ideas

The references cited in each chapter can be found in one list at the end of the book. Last, there is a companion website, http://resources.corwin.com/ReinhartzGrowingLanguage, that includes not only additional resources, but also several documents from the chapters in both Word and PDF formats.

The book has four major parts and ten chapters. Part I, Science Teaching and Learning Using a Language Lens, includes three

chapters. Chapter 1 serves as an introduction to the current science education landscape and diversity of learners and levels of language proficiency. Chapter 2 addresses the importance of effective teaching and learning principles from research and connecting them with practice. And Chapter 3 presents the 5E instructional model against the backdrop of teaching and learning through inquiry.

Part II, Science and Language in the Science Classroom: A Good Pairing**,** includes five chapters that present the content and inquiry strategies that teachers can use to promote science and language learning. Chapter 4, The Power of Questions, lays the groundwork for all of Part II. Chapter 5, Doing Science, includes sample lessons and ideas for hands-on exercises, as well as a discussion of three types of investigations: descriptive, comparative, and experimental. Chapter 6, Navigating Through the Practices, Crosscutting Concepts, and Core Science Ideas: Physical Sciences and Earth and Space Sciences, and Chapter 7, Life Sciences Across the Grades, address topics from different science disciplines, as well as engineering design, and incorporate activities for teaching them. Children's literature, used extensively throughout the book, is included in Chapters 6 and 7 to enhance and demonstrate how such texts can be utilized to augment science learning and contribute to language growth. Chapter 8, Games: A Context for Meaningful Learning and Communication Language Usage, brings Part II to a close. Integrating educational games to promote science learning is a clever way to get students to play and use their communication skills, while in reality they are learning.

Part III, Enhancing the School–Home Connection, is comprised of one chapter. Chapter 9, School–Home Science Connection, explores ways to bring children and their parents together through the study of science. Doing science at home reinforces the idea that science is everywhere, not just in school. At the same time, this chapter offers teachers ways to increase parental involvement in school activities and their children's education, which is critical to their academic success.

Part IV, Assessing Learning, also contains one chapter. Chapter 10, How Do We Know That Students Know?, describes the assessment process as well as strategies that drive teaching and student learning. The focus on assessment is on learning and how to support students in meeting the learning expectations that begin with planning rather than after teaching.

The Epilogue brings the book to a close. It offers some final thoughts about the importance of engagement that can lead to growing

language through science as teachers and their students travel the learning journey together.

There are several figures that are too long for inclusion in the chapters that can be found on the website. Last, the index is arranged by science topics and the strategies for teaching them, providing an easy way to access desired information. May your science journey be as fruitful as that of your students, because together the final results can be amazing!

To keep your journey an ongoing experience, a companion website, http://resources.corwin.com/ReinhartzGrowingLanguage, has been designed to house resources and figures, including some in Word form so that you can modify them to meet the needs of your particular students. Content will be added to the website periodically to keep the bright ideas flowing.