

SCIENCE

in the Elementary and Middle School



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Preface

Science in the Elementary and Middle School views science literacy as a vital part of the knowledge of all students and adults in the 21st century. Meaningful learning of science content, skills, and values enables students to fully participate in modern society.

Drawing upon many years of elementary and middle school teaching experience, higher education, supervising, and research, we have written this textbook to illustrate: (1) strategies for teaching relevant science for full understanding; (2) the use of an inquiry approach that empowers students to more fully comprehend their world; and (3) theory and research supporting best practices in the teaching of science.

Our text focuses on *meaningful learning of essential science knowledge that has its foundation in the national science standards*. It is built upon recognizing that students construct knowledge in their own minds so that it has meaning for them. The research literature in science education and in constructivism contributed heavily to the approach taken in this book. As we have worked with the research literature, conducted our own research, and developed and taught science lessons, we have used the theories and strategies discussed in this book. Based in the broader areas of inquiry teaching and learning, we find that the learning cycle approach to structuring lessons and units provides teachers and learners with flexibility, assuring the inclusion of the best aspects of the major theories describing how students learn. We have applied the learning cycle of Exploration, Invention, and Expansion in teaching science concepts, generalizations, skills, and dispositions.

CHAPTER FEATURES

This book is rich in examples and illustrations of how to teach science. Each chapter is organized so that it reflects the nature of inquiry learning through the learning cycle.

Exploration

Each chapter begins with an Exploration activity that helps the readers recall their prior knowledge and use it to solve a specific science teaching and learning problem. *Classroom Scenes* features bring readers into the lessons. The chapter sequence also enables readers to test and check their prior ideas.

Invention

Readers then work with explanations that develop more appropriate and usable ideas related to the teaching and learning area that makes up the focus of the chapter. Each chapter involves an active learning process. Opportunities for reflecting on the reading, checking ideas based on classroom experiences, and interacting with others appear throughout the chapter. These activities help readers reflect on their practice with the new ideas.

Lesson plans for the range of grade levels, from kindergarten through middle school, move the readers from *Classrooms Scenes* and exploratory activities to the planning that results in meaningful science teaching. Lesson plans and *Classroom Scenes* are found throughout the book.

Opportunities for application of and reflection on this book's ideas are found in the *Applying What You Know* activities. Readers will benefit most from these sections if they are used as they are encountered in the book, and if shared with others. Instructors may use these as discussion starters.

Expansion

The latter parts of each chapter focus on the application and extension of the teaching and learning area that makes up the focus of the chapter. These are accomplished through additional scenarios, sample lesson plans, and *Applying What You Know* activities.

ORGANIZATION OF THIS TEXT

Chapters 1 through 6 focus on student learning, inquiry teaching, and setting appropriate science goals. Critical elements for teaching science are dealt with in detail in the remaining chapters. Examples of these include assessment through fully involving diverse learners, integrated teaching across subject areas, classroom management, unit development, incorporating technology, safety, and facility and resource planning. Major curriculum movements, such as multicultural education and the full involvement of diverse learners in the classroom, are discussed in detail and integrated throughout the many science topics considered.

Chapters 12 through 15 tie the book's discussions together by providing a comprehensive approach with starting points for teaching physical sciences, biological sciences, and Earth sciences. These last chapters help the reader anticipate the prior knowledge students may bring to each of these three major science areas. They identify the content and appropriate strategies that can be utilized in teaching each of these areas. These last four chapters can be used as a resource for many of the earlier chapters as those are being read and reflected upon.

SUPPLEMENTS

This textbook and its accompanying materials serve as a comprehensive reference for those who are teaching and developing the science education curriculum.

Companion Website

This text-integrated supplement at www.prenhall.com/sunal provides readers with access to Internet links for resources supporting and extending this book's discussion of meaningful science instruction and curriculum through research, meaningful activities, self-assessments, chat areas, and a threaded message board. For the professor, the Syllabus Manager™ allows online creation and management of course syllabi.

Instructor's Manual

This useful tool provides additional support for instructors, including test questions and online integration.

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- **Web Destinations**—links to www sites that relate to chapter content.
- **Message Board**—serves as a virtual bulletin board to post—or respond to—questions or comments to/from a national audience.
- **Chat**—real-time chat with anyone who is using the text anywhere in the country—ideal for discussion and study groups, class projects, and so on.

To take advantage of the many available resources, please visit the *Science in the Elementary and Middle School* Companion Website at

www.prenhall.com/sunal



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NOTE: Every effort has been made to provide accurate and current Internet information in this book. However, the Internet and information posted on it are constantly changing, so it is inevitable that some of the Internet addresses listed in this textbook will change.

SCIENCE

**in the Elementary
and Middle School**

chapter

1

What Is Effective Science Teaching?

