Experiencing Elementary Science

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EXPERIENCING ELEMENTARY SCIENCE

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To my parents, who have given my life direction,
and my wife, children, and grandchildren,
who give it meaning

Preface

Before you begin reading this book, I'd like to explain several things: the meaning of the title; some of my assumptions about children, educators, and education; and the organization of sections and chapters. Knowing about these issues in advance will make the book more comprehensible and useful for you.

The title. While writing this book, I toyed with several titles, finally choosing *Experiencing Elementary Science*.

The key word in this title is *experiencing*. For me, proper experiences for children are firsthand experiences—hands-on and thought-provoking, not vicarious. They are experiences that help children to understand science concepts and principles, become more effective investigators, learn to think creatively and critically, and develop a realistically positive sense of themselves and the world around them.

Proper experiences drive an effective elementary science program. Discussions about and descriptions of proper science experiences are the "heart and soul" of this book.

Children, educators, and education. In my mind there is a huge difference between *teaching science* and *helping children learn science*. In the former a teacher, using a textbook, fills children's heads with science information. In the latter children actively seek to acquire science knowledge and skills, and teachers organize and implement experiences that encourage and facilitate the children's search.

Why and how to get children actively and physically involved in their science learning are given major emphasis in this book. Great stress is placed on how you, as a teacher, can make science learning something that children *do*, not something that is done to them.

Another idea about learning also influences the pedagogical principles espoused in this book, that learning to learn can be pleasurable. Science experiences can be and are highly pleasurable. True, they may be intellectually challenging—but children can find pleasure in meeting "doable" challenges. Science activities and program organizational patterns that help make those activities meaningful

and pleasurable to children are described throughout this book; so, too, are educational theories that undergird the activities and patterns.

Organization of the book. This book is organized to help you design effective science programs and provide meaningful instructional experiences for children.

Section 1 provides a frame of reference about elementary science. Chapter 1 gives a definition of science, discusses the role of science today, and offers reasons why you should regularly provide proper science experiences in your classroom. Chapter 2 focuses on critical and creative thinking — why thinking is so important to children and how science experiences can contribute to the development and refinement of children's thinking skills.

Section 2 touches on theory and practices in elementary science. Chapter 3 describes how and why children should experience the inquiry skills of science. Chapter 4 explains how children can effectively experience science content so they *understand* it, which is very different from memorizing and reciting a lot of information. Chapter 5 is devoted to instructional practices that help children experience science in personally meaningful ways.

Section 3 addresses how to organize and implement an experience-centered elementary science program. The focus of Chapter 6 is on how a program might be organized. Chapter 7 describes how science units can be developed, and how science activities can be created to provide children with appropriate science experiences. Chapter 8 describes a number of commercially available, experience-centered science programs. Chapter 9 outlines teacher skills that contribute to the success of an experience-centered program.

Section 4 discusses several essential and basic issues of elementary science. Chapter 10 describes science experiences for children with special needs, and Chapter 11 deals with why and how to integrate science with other elementary school disciplines, such as reading and social studies. Some practical aspects of science programming, such as organizing physical facilities, finding equipment and supplies, and developing a cadre of classroom assistants, are the subjects of Chapter 12.

Section 5 presents two prototypical units that you might adopt as is or use as sources of ideas for developing your own activities. Chapter 13 offers practical ideas for providing instruction in the inquiry processes, and Chapter 14 is a model unit on the study of sound.

As you read the book, notice that I tried to minimize do's and don'ts for you to memorize. Instead, I included numerous stories, vignettes, and descriptions of classroom experiences. Most of these are based on personal experiences. A few of them reached me secondhand from classroom colleagues and students with whom I've worked. They are intended to show you how science experiences can be made meaningful and challenging for children.

By stressing descriptions of children's experiences rather than lists of do's and dont's, I hope I have made this book readable, understandable, useful, and enjoyable.

Don Neuman

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EXPERIENCING ELEMENTARY SCIENCE

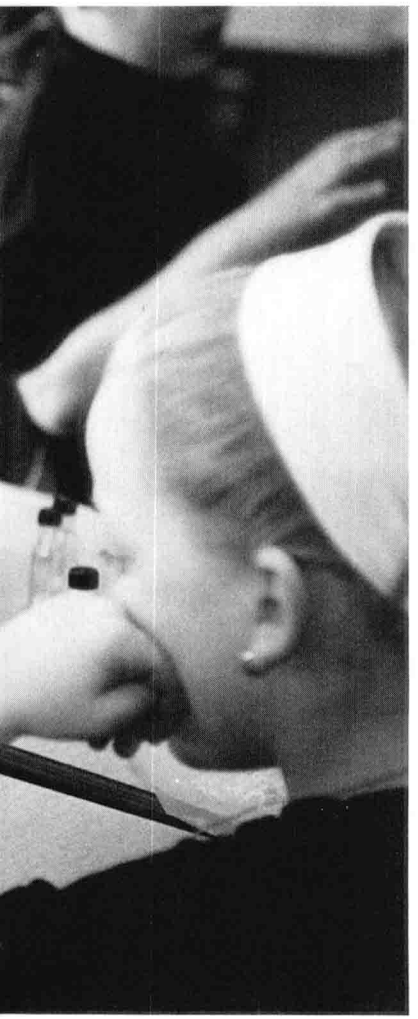
Section 1

A Frame of Reference About Elementary Science

To be able to provide proper science instruction for elementary school children, it is important for you to develop a set of personal beliefs about science and science education (which can serve as the basis for making educational decisions).

You should know the fundamentals of science as an area of meaningful intellectual pursuit; that is, what science is all about. Therefore, as you read and reflect on Chapter 1, ask yourself the following questions:

- What is science? How does the definition affect classroom practices?
- How can I use science to provide more meaningful educational experiences for children?
- Why should I teach science?
- Why are firsthand experiences in science so important for children?



Children become *really* educated only when they develop the personal skills, strategies, and inclinations to think—both analytically (critical thinking) and creatively. Children tend to respond to the expectations of their teachers. If, as a teacher, you reinforce rote memorization, your pupils will concentrate their efforts on that skill. If the emphasis in your classroom is on the quality of their thinking, they will try to develop and use the skills and strategies of higher level thinking.

Higher level thinking is the focus of Chapter 2. As you read the second chapter, think about these questions.

- What are the characteristics of critical and creative thinkers?
- Why are critical and creative thinking abilities so important to children?
- What kinds of science experiences are likely to enhance the quality of children's analytic and creative thinking skills?